Dialogic®

Dialogic® DSI SS7MD Network Interface Boards

Programmer's Manual

March 2012 U01SLT

www.dialogic.com

Copyright and Legal Notice

Copyright © 2009-2012 Dialogic Inc. All Rights Reserved. You may not reproduce this document in whole or in part without permission in writing from Dialogic Inc. at the address provided below.
All contents of this document are furnished for informational use only and are subject to change without notice and do not represent a commitment on the part of Dialogic Inc. and its affiliates or subsidiaries ("Dialogic"). Reasonable effort is made to ensure the accuracy of the information contained in the document. However, Dialogic does not warrant the accuracy of this information and cannot accept responsibility for errors, inaccuracies or omissions that may be contained in this document.
INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH DIALOGIC® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN A SIGNED AGREEMENT BETWEEN YOU AND DIALOGIC, DIALOGIC ASSUMES NO LIABILITY WHATSOEVER, AND DIALOGIC DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF DIALOGIC PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT OF A THIRD PARTY.

Dialogic products are not intended for use in certain safety-affecting situations. Please see http://www.dialogic.com/company/terms-of-use.aspx for more details.

Due to differing national regulations and approval requirements, certain Dialogic products may be suitable for use only in specific countries, and thus may not function properly in other countries. You are responsible for ensuring that your use of such products occurs only in the countries where such use is suitable. For information on specific products, contact Dialogic Inc. at the address indicated below or on the web at www.dialogic.com.

It is possible that the use or implementation of any one of the concepts, applications, or ideas described in this document, in marketing collateral produced by or on web pages maintained by Dialogic may infringe one or more patents or other intellectual property rights owned by third parties. Dialogic does not provide any intellectual property licenses with the sale of Dialogic products other than a license to use such product in accordance with intellectual property owned or validly licensed by Dialogic and no such licenses are provided except pursuant to a signed agreement with Dialogic. More detailed information about such intellectual property is available from Dialogic's legal department at 1504 McCarthy Boulevard, Milpitas, CA 95035-7405 USA. **Dialogic encourages all users of its products to procure all necessary intellectual property licenses required to implement any concepts or applications and does not condone or encourage any intellectual property infringement and disclaims any responsibility related thereto. These intellectual property licenses may differ from country to country and it is the responsibility of those who develop the concepts or applications to be aware of and comply with different national license requirements.**

Dialogic, Dialogic Pro, Dialogic Blue, Veraz, Brooktrout, Diva, Diva ISDN, Making Innovation Thrive, Video is the New Voice, VisionVideo, Diastar, Cantata, TruFax, SwitchKit, SnowShore, Eicon, Eiconcard, NMS Communications, NMS (stylized), SIPcontrol, Exnet, EXS, Vision, PowerMedia, PacketMedia, BorderNet, inCloud9, I-Gate, ControlSwitch, NaturalAccess, NaturalCallControl, NaturalConference, NaturalFax and Shiva, among others as well as related logos, are either registered trademarks or trademarks of Dialogic Inc. and its affiliates or subsidiaries. Dialogic's trademarks may be used publicly only with permission from Dialogic. Such permission may only be granted by Dialogic's legal department at 1504 McCarthy Boulevard, Milpitas, CA 95035-7405 USA. Any authorized use of Dialogic's trademarks will be subject to full respect of the trademark guidelines published by Dialogic from time to time and any use of Dialogic's trademarks requires proper acknowledgement.

The names of actual companies and products mentioned herein are the trademarks of their respective owners.

Publication Date: March 2012

Document Number: U01SLT, Issue 4

Contents

Revision History **6**

1 Introduction **7**

1.1 Related Information 7

2 Specification **8**

2.1 Product Identifier 8
2.2 Hardware Specification 8
2.2.1 Host Interface 8
2.2.2 Physical Interfaces 8
2.2.3 Capacity 9
2.2.4 Protocol Resource Support 10
2.2.5 Visual Indicators 10
2.2.6 Power Requirements 10
2.2.7 Airflow Requirements 10
2.2.8 Physical Specification 11
2.2.9 Environmental Specification 11
2.2.10 Safety, EMC and Telecommunications Specifications 11
2.2.11 Reliability 12
2.3 Operating System Support 12
2.4 Software Licenses 12
2.4.1 Run Modes 13
2.5 SNMP Support 14
2.6 Regulatory and Geographic Considerations 14

3 SS7MD Board-Specific Configuration and Operation **15**

3.1 System configuration using SS7MD Board 15
3.2 Monitoring 16
3.2.1 Configuration 16
3.2.2 Runtime Operations 16
3.3 ATM Monitoring 17
3.3.1 IMA Monitoring 17
3.4 Switching Timeslots between LIUs 18
3.4.1 Switching Model 18
3.4.2 Static Initialization 19
3.4.3 Dynamic Operation 20
3.4.4 Example Code for Building and Sending MVD_MSG_SC_LISTEN Message 20
3.4.5 Interconnecting LIUs using STREAM_XCON 21
3.5 High Speed Link Operation 22
3.6 Operation of the Thermal Sensor 22

4 Message Reference **24**

4.1 Overview 24
4.1.1 Message Type Summary 24
4.1.2 Board-specific Module IDs 27
4.1.3 Message Status Summary 28
4.2 General Configuration Messages 29
4.2.1 SSD_MSG_RESET - SSD Reset Request 29
4.2.2 SSD_MSG_RST_BOARD - Board Reset Request 30
4.2.3 SSD_MSG_BOARD_INFO - Board Information Request 32
4.2.4 MGT_MSG_CONFIG0 - Board Configuration Request 34
4.2.5 MGT_MSG_L1_CONFIG - Layer 1 Configuration Request 36
4.2.6 MGT_MSG_L1_END - Layer 1 Configuration End 38
4.3 Hardware Control Messages 39

4.3.1 LIU_MSG_CONFIG - LIU Configuration Request 40
4.3.2 LIU_MSG_CONTROL - LIU Control Request 44
4.3.3 LIU_MSG_R_CONFIG - LIU Read Configuration Request 46
4.3.4 LIU_MSG_R_CONTROL - LIU Read Control Request 47
4.3.5 MVD_MSG_SC_DRIVE_LIU - LIU Switch Initialization 48
4.3.6 MVD_MSG_SC_LISTEN - Cross Connect Switch Listen Request 49
4.3.7 MVD_MSG_RESETSWX - Reset Switch Request 50
4.3.8 MVD_MSG_SC_CONNECT - Connect Request 51
4.3.9 MVD_MSG_SC_MULTI_CONNECT - Multiple Connect Request 54
4.4 Signaling Interface Messages 56
4.4.1 API_MSG_RX_IND - Received Data Indication 57
4.4.2 API_MSG_TX_REQ - MTP2 Transmission Request 58
4.5 ATM Interface Messages 59
4.5.1 ATM_MSG_CONFIG - Configure ATM 59
4.5.2 ATM_MSG_CFG_STREAM - ATM Cell Stream Configuration 61
4.5.3 ATM_MSG_END_STREAM - Remove ATM Cell Stream Configuration 63
4.5.4 API_MSG_RX_IND - Received AAL5 Monitoring Data Indication 64
4.5.5 API_MSG_RX_ERR - Received AAL5 Monitoring Error 65
4.5.6 ATM_MSG_R_STREAM_STATS - Per ATM Cell Stream Statistics 67
4.5.7 ATM_MSG_AAL_CFG_MON_LINK - Configure AAL Monitor Link 69
4.5.8 ATM_MSG_AAL_END_LINK - Remove AAL Link 71
4.5.9 ATM_MSG_R_AAL_LINK_STATS - Per Monitored Link Statistics 72
4.5.10 ATM_MSG_STREAM_STATE - ATM Stream Status Indication 73
4.5.11 ATM_MSG_LINK_STATE –AAL Link Status Indication 74
4.5.12 ATM_MSG_TRACE_MASK - Set Trace Mask Request 75
4.6 Q.SAAL Interface Messages 77
4.6.1 QSL_MSG_CFG_LINK - Configure Q.SAAL Link 77
4.6.2 QSL_MSG_CFG_TIMERS - Configure Timers per Q.SAAL Link 80
4.6.3 QSL_MSG_END_LINK - Remove Q.SAAL Link 82
4.6.4 SS7_MSG_TRACE_MASK - Set Trace Mask Request (Q.SAAL) 83
4.6.5 SS7_MSG_R_STATE - Read Link State Request (Q.SAAL) 86
4.6.6 SS7_MSG_R_STATS - Read Link Statistics Request (Q.SAAL) 87
4.6.7 MGT_MSG_QSL_EVENT - Q.SAAL Event Indication 88
4.6.8 MGT_MSG_SS7_STATE - Link State Indication (Q.SAAL) 89
4.6.9 Primitives issued from MTP3-b 90
4.6.10 Primitives issued to MTP3-b 91
4.7 Event Indication Messages 92
4.7.1 MGT_MSG_EVENT_IND – Error Indication 92
4.7.2 SSD_MSG_STATE_IND - Board Status Indication 93
4.7.3 API_MSG_CNF_IND - Configuration Completion Status Indication 94
4.7.4 MVD_MSG_LIU_STATUS - LIU Status Indication 95
4.7.5 MGT_MSG_SS7_EVENT - MTP2 Q.791 Event Indication 96
4.8 Status Request Messages 98
4.8.1 LIU_MSG_R_STATE - LIU Read State Request 98
4.8.2 LIU_MSG_R_STATS - LIU Read Statistics Request 99
4.8.3 MGT_MSG_R_BRDINFO - Read Board Info Request 101
4.8.4 DVR_MSG_R_L1_STATS – Layer 1 Link Statistics Request 102

Appendix A - Protocol Configuration Using Discrete Messages 104

A.1 Protocol Configuration Using Individual Messages 104
A.2 Monitoring Configuration Using Individual Messages 107
A.3 Q.SAAL Protocol Configuration Using Individual Messages 108

Appendix B - Thermal guidelines for server selection 111

B.1 Chassis Selection 111

Glossary of Terms 113

Tables

Table 1. SS7 Link Capacity of the Dialogic® DSI SS7MDL4 Network Interface Board..... 9
Table 2. Dialogic® DSI SS7MD Software Licenses 13
Table 3. Link License Resource Requirements 13
Table 4. Protocol Run Modes.....13
Table 5. Link Type Available by Run Mode 14
Table 6. Message Summary.....24
Table 7. DSI SS7MD Board Software Module IDs.....27
Table 8. Message Status Responses.....28

Revision History

Issue	Date	Description
4	March 2012	Manual restructured for use in conjunction with Software Environment Programmer's Manual Issue 9 or later. All config.txt configuration commands moved to that document.
3	July 2009	Description of thermal sensor operation added.
2	May 2009	Support for introduction of ATM termination mode and timestamping.
1	April 2009	Supports the first production release.

Note: The current version of this guide can be found at:
http://www.dialogic.com/support/helpweb/signaling

1 Introduction

Dialogic® DSI SS7MD Network Interface Boards are specialized T1/E1/J1 SS7 signaling boards suitable for use in PCI Express form factor systems. The boards use the common Dialogic® DSI software API to the application that enables applications to be easily ported.

The boards provide a hardware platform to enable running Dialogic® DSI Protocol Stacks for the realization of Signaling System Number 7 signaling nodes. In addition, the DSI SS7MD Boards can be used to build high performance monitoring applications. The boards can be used under the Linux, Solaris SPARC and Solaris x86 operating systems.

This manual is the Programmer's Manual for the Dialogic® DSI SS7MD range of network interface boards. It is targeted for system developers who are integrating the boards and who have chosen to develop applications that use the underlying DSI Protocol Stack. The manual includes information on:

- SS7MD board specification
- SS7MD board-specific configuration
- Operation of the SS7MD board with Dialogic® DSI Software Protocols
- SS7MD board-specific message reference

The manual should be used in conjunction with the appropriate Installation Guide and Regulatory Notice for the board. These and other supporting documentation, including the Programmer's Manuals for the individual protocol modules, are listed in Section 1.1 Related Information.

Note: This document is specific to the Dialogic® DSI SS7MD board. Users of other Dialogic® DSI board types should refer to the appropriate documentation for that board.

1.1 Related Information

Refer to the following for related information:

- *Dialogic® DSI SS7MDL440Q Network Interface Boards Installation Guide*
- *Dialogic® DSI SS7MDL440Q Network Interface Boards Regulatory Notices*
- *Dialogic® Distributed Signaling Interface Components - Software Environment Programmer's Manual*
- *Dialogic® SS7 Protocols MTP3 Programmer's Manual*
- *Dialogic® SS7 Protocols ISUP Programmer's Manual*
- *Dialogic® DSI Protocol Stacks - Host Licensing User Guide*
- *Dialogic® DSI Protocol Stacks SNMP User Manual*

Current software and documentation supporting Dialogic® DSI SS7MD Boards is available at http://www.dialogic.com/support/helpweb/signaling.

2 Specification

This section provides information about:

- Product Identifier
- Hardware Specification
- Operating System Support
- Software Licenses
- SNMP Support
- Regulatory and Geographic Considerations

2.1 Product Identifier

The full designation of the Dialogic® DSI SS7MD Network Interface Board product is:

Dialogic® DSI SS7MDL4 Network Interface Board - Low Profile PCI Express Form Factor Product

The product identifier is "SS7MDL440Q"

Within the remainder of the document the generic terms "DSI SS7MD" or "SS7MD" are used.

A low profile PCI Express form factor with 4 T1/E1/J1 ports, supporting up to 124 SS7 links, up to 4 SS7 HSL links, up to 128 Q.SAAL links, or 4 ATM cell streams.

2.2 Hardware Specification

2.2.1 Host Interface

The DSI SS7MDL4 board has a x1 lane electrical, x4 lane physical PCI Express connector and is a low profile PCI Express form factor, which can be installed in x4, x8, or x16 lane PCI Express slots. The board is supplied with two End Brackets suitable for low profile and full height installation.

Note: The DSI SS7MDL4 board is a high performance densely packed low-profile PCIe board supporting high message rates. In achieving this performance, the board may dissipate up to 17W and this must be taken into consideration when selecting both the host chassis and the PCI Express slot in which to install the board. Refer to Section 2.2.7, "Airflow Requirements".

2.2.2 Physical Interfaces

The DSI SS7MDL4 board supports four individually software configurable E1/T1/J1 digital trunk interfaces with the following properties:

- **Standard**

— Four interfaces each are software configurable as either T1, E1, or J1

— High impedance software selectable

- **Pulse mask**

— T1: ANSI T1.403

— E1: ITU-T G.703

— J1: TTC JT-G.703

- **Data rate**

— T1: 1544 kbits/s ± 50 ppm

— E1: 2048 kbits/s ± 50 ppm

— J1: 1544 kbits/s ± 50 ppm

- **Frame format**

— T1: F4, D3/D4, ESF, and F72/SLC96

— E1: E1 and E1-CRC4

— J1: J1 frame format

- **Line codes**

— T1: B8ZS and AMI

— E1: HDB3 and AMI

— J1: B8ZS and AMI

- **Connector type**

— RJ-48C

2.2.3 Capacity

The SS7 link capacity of the DSI SS7MDL4 board is as follows:

Table 1. SS7 Link Capacity of the Dialogic® DSI SS7MDL4 Network Interface Board

Link type	Max. number of links per board
Q.703 LSL (64kbit/s)	124
Q.703 LSL (56kbit/s)	123
Q.703 LSL (48kbit/s)	123
Q.703 Annex A HSL Framed	4
Q.2140/Q.2110 Q.SAAL links (terminated)	128
AAL5 (including Q.SAAL) links (monitored)	128
ATM cell streams	4

Note: In order to monitor both directions of a signaling link, the user must separately connect each direction of the signaling link to the receive connection of two different LIUs on the DSI SS7MDL4 board.

2.2.4 Protocol Resource Support

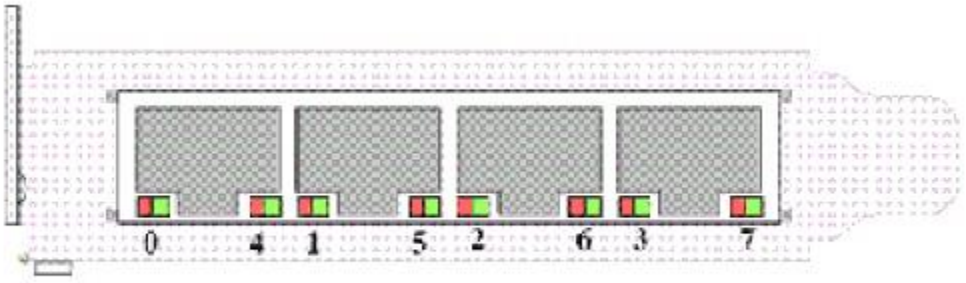
When terminating SS7 signaling, the DSI SS7MD board runs the SS7 Message Transfer Part, Layer 2 (MTP2) on the board and works in conjunction with higher layer protocols including MTP3, ISUP, SCCP, TCAP, MAP, INAP and IS41 running on the host. The protocols are enabled by software licenses. See Section 2.4, "Software Licenses".

The DSI SS7MDL4 board supports passive monitoring of HDLC format data links including, for example, SS7, LAPB, LAPD, ISDN, and DPNSS. In this mode, the received messages are directly reported to the application.

It is possible to use monitor and terminate protocol operation concurrently on the same signaling board.

2.2.5 Visual Indicators

The DSI SS7MDL4 board includes the following visual indicators:



- T1/E1/J1 dual-color Green/Red status LEDs:

— Green indicates a valid link

— Red indicates a line alarm

Note: Only the LEDs 0, 1, 2, and 3 are active (LEDs 4, 5, 6, and 7 are reserved for future use).

2.2.6 Power Requirements

Power requirements are described as follows:

- **+12 VDC power**

1.1 A typical, 1.4 A max.

- **Power dissipation**

17 W max.

2.2.7 Airflow Requirements

The board should be installed in host computers providing airflow of at least 300 linear feet per minute (LFM), 1.5 m/s. This airflow should be evenly distributed across the board. See Appendix B, "Thermal guidelines for selecting suitable servers for use with a Dialogic® DSI SS7MDL4 Network Interface Board".

2.2.8 Physical Specification

- **Form factor**

Low-profile PCIe

- **Dimensions**

Board	
Length	167.65 mm (6.60 inches)
Height	68.90 mm (2.731 inches)
Packaged	
Length	277 mm (10.9 inches)
Width	180 mm (7.08 inches)
Height	55 mm (2.16 inches)
Weight	
Board	150 g
Packaged Board	345 g

2.2.9 Environmental Specification

Environmental specification is described as follows:

- **Operating temperature range**

+0°C to +55°C

- **Storage temperature range**

-20°C to +70°C

- **Humidity**

5% to 95% non-condensing

- **Altitude**

0 to 15,000 ft

- **Vibration**

0.1 g, 5 to 100 Hz

- **Shock**

Packaged equipment drop test 29.5 in (750 mm)

2.2.10 Safety, EMC and Telecommunications Specifications

Safety, EMC and telecommunications specification information is provided by the following:

- **Dialogic® DSI SS7MDL440Q Network Interface Board Regulatory Notices**

Supplied with each product and provides a list of the specifications to which DSI SS7MDL4 board conforms.

- **International Declaration of Conformity**

See http://www.dialogic.com/declarations.

- **Country-Specific Approvals**

See the Global Product Approvals list at http://www.dialogic.com/declarations.

Alternatively, contact your Dialogic technical sales representative for more information.

2.2.11 Reliability

Product reliability is described by:

- **MTBF Predication**

797,000 hours Telcordia SR-232, ground benign @ 40°C

- **Warranty**

See Dialogic® Telecom Products Warranty Information at http://www.dialogic.com/warranties.

2.3 Operating System Support

The Dialogic® DSI SS7MD Network Interface Board can be used under the following operating systems:

- Linux
- Solaris SPARC
- Solaris x86

Users should download the appropriate Dialogic® DSI Development Package from the web-site at http://www.dialogic.com/support/helpweb/signaling

2.4 Software Licenses

The DSI SS7MDL4 code file supports different MTP2 link densities on the board. These are enabled using a Host Software License that is to be ordered at the same time as the hardware. The Host Software License licenses a specific number of link resources on the host that may be shared between boards in the same chassis.

For details on how to activate the host license please refer to *Dialogic® DSI Protocol Stacks - Host Licensing User Guide* at http://www.dialogic.com/support/helpweb/signaling.

A combination of link types (provided they are supported by the board's run mode) may be configured by the host (on any board) provided the required link resources are available. A configured link's resources are freed when either the link is unconfigured or the board on which the link is currently active is reset.

The following table shows the available licenses:

Table 2. Dialogic® DSI SS7MD Software Licenses

Software License	Code	Link Resources
SW LICENSE, 16 LSL	SS7SBMDM16	16
SW LICENSE, 32 LSL or 1 MTP or ATM HSL	SS7SBMDM32	32
SW LICENSE, 64 LSL, 2 MTP or ATM HSL	SS7SBMDM64	64
SW LICENSE, 128 LSL, 4 MTP or ATM HSL	SS7SBMDM128	128
SW LICENSE, 256 LSL, 8 MTP or ATM HSL	SS7SBMDM256	256

The number of link resources required for each link type is shown below:

Table 3. Link License Resource Requirements

Link Type	Resources Required
LSL (64Kb / 56Kb / 48Kb)	1
Monitored LSL	0.5
HSL (2Mb / 1.5Mb)	32
Monitored HSL	16
ATM (2Mb / 1.5Mb)	32
Monitored ATM	16

Note: IMA bundles are licensed based on the number of ATM cell streams they contain.

2.4.1 Run Modes

The run mode of a board determines the combination of protocols (LSL/HSL/ATM/IMA) available to use. To change the run mode it is necessary to reset the board.

Table 4. Protocol Run Modes

Value	Run Mode	Protocols Selected to Run on the Board
34	LSL	MTP2 Low Speed Links
35	HSL	MTP2 High Speed Links and/or MTP2 Low Speed Links
36	ATM	ATM links and/or MTP2 High Speed Links and/or MTP2 Low Speed Links
37	IMA	Inverse Multiplexed ATM links

The following combinations of link types are available to the user:

Table 5. Link Type Available by Run Mode

Run Mode	LSL Links	HSL Links	ATM Links	IMA Links
LSL	Y			
HSL	Y	Y		
ATM	Y	Y	Y	
IMA			Y	Y

2.5 SNMP Support

The Dialogic® Distributed Structured Management Information (DSMI) Simple Network Management Protocol (SNMP) Agent provides SNMP monitoring functionality for the Dialogic® DSI SS7 Development Package.

Dialogic® DSMI SNMP software supports SNMP V1, V2, and V3 reporting the state and events for Dialogic® DSI SS7MD Network Interface Boards and Dialogic® DSI Protocol Stacks through use of SNMP traps as well as queries from an SNMP manager.

The Dialogic® DSMI MIBs are distributed within the Dialogic® DSI SS7 Development Package in the /opt/DSI sub-directory as a compressed ZIP file: dsi-mibs.zip.

For details of the DSMI SNMP MIBs supported, events, SNMP traps and configuration, refer to the *Dialogic® DSI Protocol Stacks SNMP User Manual*.

2.6 Regulatory and Geographic Considerations

Certain functions of Dialogic® DSI SS7MD Network Interface Board, although implemented in hardware, have selectable options that are configured by the software. A user or integrator must consider the requirements of the application when choosing these settings, but must also consider any local regulatory requirements for the intended deployment location to provide a compliant overall system. As an aid to this process, the table below details some of the areas where the correct selection of configuration options may be required.

Configuration Area		Configuration Options
T1/E1 Ports	Interface type	liu_type parameter in LIU_CONFIG command
	Pulse shape	liu_type parameter in LIU_CONFIG command
	Line code	line_code parameter in LIU_CONFIG command
	Frame format	frame_format parameter in LIU_CONFIG command
	CRC/E-bit operation	CRC_mode parameter in LIU_CONFIG command
	Clock priorities	flags parameter in SS7_BOARD command and options parameter in LIU_CONFIG command
Links	Link termination or monitoring mode	MTP_LINK or MONITOR_LINK commands

3 SS7MD Board-Specific Configuration and Operation

Before attempting software configuration, you should gain an understanding of the flexibility of the protocol stack, the run-time options that exist and the mechanisms that are used to select specific features. These are explained in the *Dialogic® Distributed Signaling Interface Components - Software Environment Programmer's Manual* which also describes the basic principles of modules and message passing.

This section provides product-specific options relating to the following:

- System configuration using SS7MD Board
- Monitoring
- ATM Monitoring
- Switching Timeslots between LIUs
- High Speed Link Operation
- Operation of the Thermal Sensor

3.1 System configuration using SS7MD Board

The Dialogic® DSI MTP2 Layer protocol module runs on the board. The other SS7 protocol modules (MTP3, ISUP, SCCP, TCAP, MAP, INAP, and IS41) run on the host machine.

Host protocol software is available for Linux, Solaris SPARC, and Solaris x86 operating systems. For more information or to purchase, contact an authorized distributor or your account manager.

The Dialogic® DSI SS7MD Network Interface Board may be configured for most applications using the s7_mgt utility. The s7_mgt utility is the primary tool for configuring a DSI software stack. It is a single-shot configuration utility that takes configuration commands from a text file (config.txt).

Details on how to configure a system using s7_mgt are provided in the *Dialogic® Distributed Signaling Interface Components - Software Environment Programmer's Manual*.

As an alternative to using s7_mgt, users can build their own configuration utilities using messaged-based configuration. In this case users should refer to the definitions of individual messages in Section 4, Message Reference on page 24.

The Code File contains the operating firmware for the board which is downloaded to the board at run-time by the ssdm binary. The code file should be specified in the SS7BOARD command in the config.txt file.

The following code files are available for the SS7MD board:

- The ss7mcd.dc6 code file which should be used for SS7MD boards running the LSL, HSL or ATM run modes.
- The ss7.dc6 code file which should be used for SS7MD boards when timeslot switching is necessary.
- The ima.dc6 code file which should be used for SS7MD boards running the IMA run mode.

Note: The ss7.dc6 and ss7mcd code files are distributed as part of the Dialogic® DSI Development Package. The ima.dc6 code file is available on request.

The code file requires a host license which enables the software to run on the board, details on how to use a Host License are given in the *Dialogic® Distributed Signaling Interface Components Host Licensing User Guide*.

3.2 Monitoring

The DSI SS7MD board can be used in conjunction with the SS7 Development Package for the appropriate operating system (Linux, Solaris SPARC or Solaris x86) to realize a high-performance protocol monitor with up to 4 boards, each monitoring a certain number of links (see the table in Section 2.4.1, "Run Modes").

In this mode the board is able to monitor many HDLC based signaling protocols including SS7, LAPB, Q.921 (ISDN PRI) and DPNSS. The protocol should have a minimum frame length (excluding flags) of 5 octets and a maximum of 278 octets, and must use the CRC polynomial (x16 + x12 + x5 + 1). When operating in monitoring mode, the 3rd and successive identical frames may be filtered.

It is possible to configure monitoring and terminated SS7 links on the same signaling board.

For receive only operation, the board allows the T1/E1/J1 interfaces to be configured in any of the following modes:

- Normal terminated impedance

- High impedance (not recommended for new designs)

- Protected Monitoring Point mode (preferred mode of operation for monitoring).

When using High Impedance mode care should be taken to avoid long cable runs as this can result in poor signal quality due to signal reflections.

3.2.1 Configuration

The user needs to set up the configuration for the T1/E1/J1 interface and the operating parameters for each link to be monitored. This can be achieved using the config.txt file in conjunction with the s7_mgt configuration utility. Users wishing to use discrete message-based configuration should to Section A.2, "Monitoring Configuration Using Individual Messages".

3.2.2 Runtime Operations

Once configured, whenever a frame is received, it is reported to the user's application as an API_MSG_RX_IND message.

During operation, the user may also read (and optionally reset) various statistics on a per-link basis by sending a DVR_MSG_R_L1_STATS message.

3.3 ATM Monitoring

The system can also be used to monitor AAL5 traffic that is running over ATM links.

The following is an example config.txt configuration file to support AAL5 Monitoring:

```
*******************************************************************************
* Example Protocol Configuration File (config.txt) for use with
* Dialogic(R) DSI SS7MD Network Interface Boards.
*******************************************************************************
*
* SS7_BOARD   <board_id> <board_type> <flags> <code_file> <run_mode>
SS7_BOARD  0 SS7MD 0x0001 ./DC/ss7.dc6  ATM
*
* LIU_CONFIG <board_id> <liu_id> <liu_type> <line_code> <frame_format> <crc_mode>
[<build_out>]
LIU_CONFIG  0  0  6 1  1  1  0
*
* ATM_CONFIG  <options> <num_streams>
ATM_CONFIG   0x0000  4
*
*
* ATM_STREAM <id> <board_id> <cellstream_id> <liu_id> <options> <ima_frame_len>
<max_frame_len> <def_vpi> <def_vci> <timeslot>
ATM_STREAM  3  0 1 0 0x01  0 280 12  10  0xfffefffe
*
* MONITOR_LINK <link_id> <board_id> <blink> <atm_stream> <VPI-VCI> <user_module>
<filter> <flags> <phys_mask> ATM
MONITOR_LINK  0 0 0 3 9-128  0x0d  0  0x0000  0x00 ATM
*
*******************************************************************************
```

The underlying ATM system is configured using the ATM_CONFIG command. The links to be used are then specified using the ATM_STREAM command and monitoring is established for these links using the MONITOR_LINK command.

Note: The use of these commands and others is explained in the DSI Software Environment Programmer's Manual.

3.3.1 IMA Monitoring

When configuring IMA Monitoring, the maximum limit is 31 monitoring links per IMA bundle.

3.4 Switching Timeslots between LIUs

The Dialogic® DSI SS7MD Boards support multiple T1/E1/J1 Line Interface Units (LIUs). The onboard signaling processor handles the SS7 signaling timeslots, while the remaining circuits (voice or data bearer circuits) are switched to another onboard LIU for distribution to other boards.

Communication between the application and the board is message-based. Initial configuration is typically handled by the s7_mgt protocol configuration utility that takes commands from the config.txt protocol configuration file and generates the necessary configuration messages for the board. Subsequent operation is entirely message driven, with messages being passed in both directions between the board and the application.

One of the roles of the application is to control the dynamic switching between LIUs. This section provides details of how to interface with the cross connect switch, including the initial (static) configuration and the subsequent (dynamic) switching. The operation of the switching interface is described in terms of the SCbus switching model using:

- MVD_MSG_SC_DRIVE_LIU and MVD_MSG_SC_LISTEN messages
- LIU_SC_DRIVE, SCBUS_LISTEN, and STREAM_XCON config.txt commands.

Note: The use of these commands and others is explained in the DSI Software Environment Programmer's Manual.

3.4.1 Switching Model

The basic switching model assumes that at system initialization all incoming T1/E1/J1 timeslots and all resource board output timeslots are connected to channels on the cross connect switch and that these connections are never changed. This scheme has the advantage that once the cross connect switch drivers have been set up, they are never changed, reducing the chances of inadvertently causing switch conflict. It also means that the user can predict the exact switch channels where any input timeslot can be located, which in turn can assist with fault diagnosis and general system test.

Having completed system initialization, drives to the switch are set up. Then, on a dynamic (call-by-call) basis, the connectivity must be modified when a new call arrives and when it finishes.

When a new call arrives, typically the application will need to initiate two listen commands as follows:

- One command causes the resource to listen to the appropriate switch channel to hear the incoming voice path.
- The other command causes the T1/E1/J1 interface to listen to the output from the resource board to generate the outgoing voice path.

Figure 1. Switch Connections shows the function of the commands.

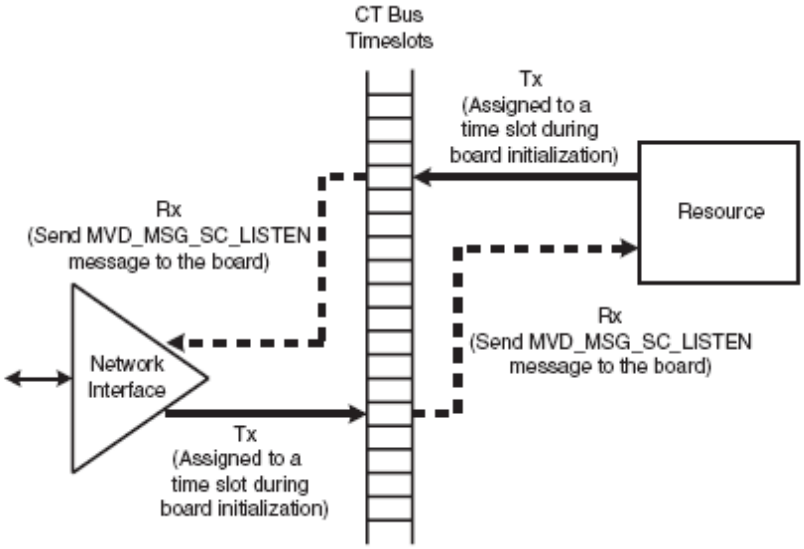


Figure 1. Switch Connections

3.4.2 Static Initialization

Static initialization is handled by the s7_mgt protocol configuration utility. For each T1/E1/J1 Line Interface Unit (LIU), the user should include an LIU_SC_DRIVE command in the config.txt protocol configuration file. The LIU_SC_DRIVE command has several parameters. The board_id and liu_id parameters together uniquely identify the affected LIU. The sc_channel parameter is the channel number of the first channel on the switch that is to be used for timeslots from the specified LIU. The ts_mask parameter is a mask identifying which timeslots on the T1/E1/J1 interface are carrying voice circuits (as opposed to signaling) and therefore need to be connected to the switch. The least significant bit of ts_mask should be 0 when driving from a T1/E1/J1 interface.

As an example, consider a two board system where the first board has four E1 ports and the second board has four T1 ports (timeslots are numbered on a per board basis).

LIU_SC_DRIVE 0 0 0 0xfffefffe * 30 E1 voice ccts on ts 1..15 & 17..31

LIU_SC_DRIVE 0 1 30 0xfffefffe * 30 E1 voice ccts on ts 1..15 & 17..31

LIU_SC_DRIVE 0 2 60 0xfffefffe * 30 E1 voice ccts on ts 1..15 & 17..31

LIU_SC_DRIVE 0 3 90 0xfffefffe * 30 E1 voice ccts on ts 1..15 & 17..31

LIU_SC_DRIVE 1 0 23 0x00fffffe * 23 T1 voice ccts on timeslots 1..23

LIU_SC_DRIVE 1 1 46 0x00fffffe * 23 T1 voice ccts on timeslots 1..23

LIU_SC_DRIVE 1 2 69 0x00fffffe * 23 T1 voice ccts on timeslots 1..23

LIU_SC_DRIVE 1 3 72 0x00fffffe * 23 T1 voice ccts on timeslots 1..23

3.4.3 Dynamic Operation

The application controls dynamic changes to switching by sending the MVD_MSG_SC_LISTEN message to the board. This message contains the liu_id (in the range 0 to one less than the number of LIUs), the timeslot number on the T1/E1/J1 interface and the switch channel number (sc_channel) to which the timeslot should listen. The message is directed to the correct board by calling the GCT_set_instance( ) function prior to calling the GCT_send( ) function.

When a new call arrives, the application will need to issue two listen commands (although they will not necessarily both apply to the SS7 board). One connects the voice circuit in the forward direction and the other connects voice circuit in the backward direction. See Figure 1. Switch Connections.

3.4.4 Example Code for Building and Sending MVD_MSG_SC_LISTEN Message

The following code demonstrates how to build and send a MVD_MSG_SC_LISTEN message to the DSI SS7MD Board to listen to a switch timeslot.

```
/*
* Example function for building and sending an MVD_MSG_SC_LISTEN
* message to an SS7 signaling card.
*
* The only change that the user needs to make is to fill in the
* OUR_MOD_ID definition below so that it is equal to the module_id
* of the application module.
*/
#define OUR_MOD_ID (0xef)
#include "system.h" /* Definitions of u8, u16 etc */
#include "msg.h" /* Definitions of HDR, MSG etc */
#include "libc.h" /* Used only for memset prototype */
#include "sysgct.h" /* Prototypes for GCT_xxx */
#include "pack.h" /* Prototypes for rpackbytes */
#include "ss7_inc.h" /* Message & module definitions */
/*
* Macro to generate the value for use in the rsp_req field of the
* message header in order to request a confirmation message:
*/
#define RESPONSE(module) (((unsigned short) 1) << ((module) & 0x0f))
/*
* Function to drive an SCbus / CT Bus timeslot
* onto a timeslot on a PCM port:
*/
int listen_to_scbus(board_id, liu_id, timeslot, sc_channel)
int board_id; /* board_id (0, 1, 2 ...) */
int liu_id; /* PCM port id (0 .. one less than no. of LIUs) */
int timeslot; /* Timeslot on the PCM port (1 .. 31) */
int sc_channel; /* SCbus / CT Bus channel number */
{
MSG *m;
u8 *pptr;
/*
* Allocate a message (and fill in type, id, rsp_req & len):
*/
if ((m = getm(MVD_MSG_SC_LISTEN, 0, RESPONSE(OUR_MOD_ID), MVDML_SCLIS)) != 0)
{
```

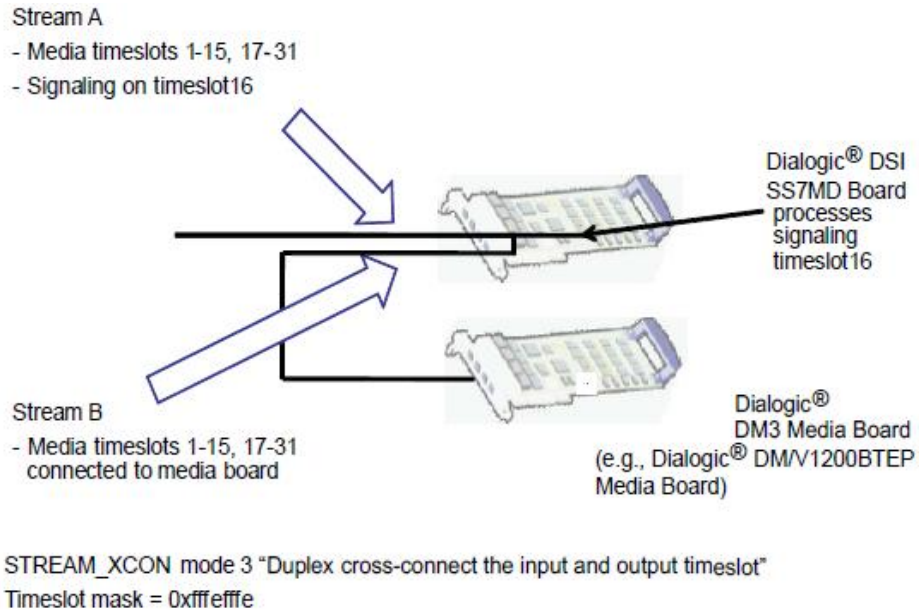
```
pptr = get_param(m);
memset(pptr, 0, m->len);
/*
* Enter the parameters in machine independent format:
*/
rpackbytes(pptr, MVDMO_SCLIS_liu_id, (u32)liu_id, MVDMS_SCLIS_liu_id);
rpackbytes(pptr, MVDMO_SCLIS_timeslot, (u32)timeslot, MVDMS_SCLIS_timeslot);
rpackbytes(pptr, MVDMO_SCLIS_sc_channel, (u32)sc_channel,
MVDMS_SCLIS_sc_channel);
m->hdr.dst = MVD_TASK_ID;
m->hdr.src = OUR_MOD_ID;
/*
* Call GCT_set_instance to route the message to the
* correct board and GCT_send to send the message.
* If GCT_send returns non-zero release the message.
*/
GCT_set_instance(board_id, (HDR *)m);
if (GCT_send(m->hdr.dst, (HDR *)m) != 0)
  relm((HDR *)m);

return(0);
}
```

3.4.5 Interconnecting LIUs using STREAM_XCON

Interconnection of two Line Interface Units (LIUs) on the board is also supported through the STREAM_XCON command which controls the cross connect switch on the signaling board, enabling the cross connection of timeslots between any two LIUs within the board. This command simplifies the cross connection enabling a group of timeslots on one LIU to be directly mapped to the same numbered timeslots on a second LIU on the same board using a single command. A typical usage of the STREAM_XCON command is shown in Figure 2. Drop and Insert which implements Drop and Insert functionality.

Figure 2. Drop and Insert


Stream A
- Media timeslots 1-15, 17-31
- Signaling on timeslot16
Dialogic® DSI SS7MD Board processes signaling timeslot16
Stream B
- Media timeslots 1-15, 17-31 connected to media board
Dialogic® DM3 Media Board (e.g., Dialogic® DM/V1200BTEP Media Board)
STREAM_XCON mode 3 "Duplex cross-connect the input and output timeslot"
Timeslot mask = 0xfffefffe

3.5 High Speed Link Operation

High Speed Link (HSL) operation is supported in the following mode:

- Structured mode, where the data stream is framed as for conventional SS7:

— For T1, 8 bits in each of 24 timeslots are available for signaling.

— For E1, timeslot 0 is used for framing and 31 timeslots are available for signaling.

The implementation supports the use of both 7-bit and 12-bit sequence numbers as a run-time configuration option.

The DSI SS7MD Board will support up to 4 HSL links, dependent upon the licensing.

3.6 Operation of the Thermal Sensor

Thermal Protection

The Dialogic® DSI SS7MDL4 Network Interface Board is a high performance, densely packed, low profile PCIe board supporting high message rates. In achieving this performance, the board may dissipate up to 17W and this must be taken into consideration when selecting both the host chassis and the PCI Express slot in which to install the board, refer to 0, "Appendix B - Thermal guidelines for server selection". In order to guard against hardware failure due to inadequate cooling from the host chassis, the board is provided with an on-board thermal sensor which, in the event that the board gets too hot, will shutdown the board.

Safety Threshold

The temperature of the boards within a system are periodically measured, and should the temperature of any board exceed a fixed safety threshold then a warning will be provided to the host chassis that the threshold has been passed, a MGT_MSG_EVENT_IND message with a status field of 0xc0 (Exceeded Thermal Threshold) will be sent to SIU_MGT_TASK_ID (0xdf). If the board temperature remains above this threshold limit for 30 minutes, but does not exceed the temperature at which the board shuts down, the MGT_MSG_EVENT_IND message will be repeated and this will continue every 30 minutes whilst the condition is maintained.

Thermal Shutdown

If the temperature of the board continues to rise, a second threshold will be passed at which, to protect the hardware, the board will be shutdown. On reaching this Thermal Shutdown threshold, the user will be notified via a SSD_MSG_STATE_IND message with a status field of 0x62 (Board Failure) and a failure code parameter set to 0xd7. A MGT_MSG_EVENT_IND message with a status field of 0xd7 (Shutdown due to Thermal Issues) will also be sent.

Once these messages have been sent, all outstanding messages and all subsequently received messages destined for the board will be discarded.

Reset after Thermal Shutdown

Once the board is shutdown, power can only be restored by a full power cycle of the board.

4 Message Reference

4.1 Overview

This section describes the individual messages that may be sent to or received from a Dialogic® DSI SS7MD Board. Some messages are sent by the user's application software, while others are sent by utility programs such as the s7_mgt protocol configuration utility.

Prior to sending any message to the board, the application should call the **GCT_set_instance( )** library function to select which board the message will be sent to. After receiving a message from the board, the application should call the **GCT_get_instance( )** library function to determine which board the message came from. These library functions are described in the *Software Environment Programmer's Manual*.

The various messages used are grouped in the following categories:

- General Configuration Messages
- Hardware Control Messages
- Signaling Interface Messages
- ATM Interface Messages
- Q.SAAL Interface Messages
- Event Indication Messages
- Status Request Messages

4.1.1 Message Type Summary

The following table lists, by message type, the messages described in this manual.

Table 6. Message Summary

Message Type	Mnemonic	Description
0x0008	MGT_MSG_EVENT_IND	Error Indication
0x0201	MGT_MSG_SS7_STATE	Link State Indication
0x0202	MGT_MSG_SS7_EVENT	MTP2 Q.791 Event Indication
0x026a	ATM_MSG_STREAM_STATE	ATM Stream Status Indication
0x026b	ATM_MSG_LINK_STATE	AAL Link Status Indication
0x026c	MGT_MSG_QSL_EVENT	Q.SAAL "Q.791 style" Event Indication
0x06a0	SSD_MSG_STATE_IND	Board Status Indication
0x0e01	MVD_MSG_LIU_STATUS	LIU Status Indication
0x0f09	API_MSG_CNF_IND	Configuration Completion Status Indication

Message Type	Mnemonic	Description
0x1213		Confirmation of SS7_MSG_TRACE_MASK
0x126d		Confirmation of ATM_MSG_TRACE_MASK
0x1e36		Confirmation of LIU_MSG_R_STATS
0x1e37		Confirmation of LIU_MSG_R_CONFIG
0x1e38		Confirmation of LIU_MSG_R_CONTROL
0x1e39		Confirmation of LIU_MSG_R_STATE
0x2214		Confirmation of SS7_MSG_R_STATS
0x2215		Confirmation of SS7_MSG_R_STATE
0x2263		Confirmation of ATM_MSG_R_STREAM_STATS
0x2266		Confirmation of ATM_MSG_R_AAL_LINK_STATS
0x2f0d		Confirmation of MGT_MSG_R_BRDINFO
0x3260		Confirmation of ATM_MSG_CONFIG
0x3261		Confirmation of ATM_MSG_CFG_STREAM
0x3262		Confirmation of ATM_MSG_END_STREAM
0x3264		Confirmation of ATM_MSG_AAL_CFG_MON_LINK
0x3265		Confirmation of ATM_MSG_AAL_END_LINK
0x3267		Confirmation of QSL_MSG_CFG_LINK
0x3268		Confirmation of QSL_MSG_CFG_TIMERS
0x3269		Confirmation of QSL_MSG_END_LINK
0x3680		Confirmation of SSD_MSG_RESET
0x3681		Confirmation of SSD_MSG_RST_BOARD
0x3689		Confirmation of SSD_MSG_BOARD_INFO
0x3e00		Confirmation of MVD_MSG_RESETSWX
0x3e17		Confirmation of MVD_MSG_SC_LISTEN
0x3e19		Confirmation of MVD_MSG_SC_MULTI_CONNECT
0x3e1f		Confirmation of MVD_MSG_SC_CONNECT
0x3e34		Confirmation of LIU_MSG_CONFIG
0x3e35		Confirmation of LIU_MSG_CONTROL
0x3f10		Confirmation of MGT_MSG_CONFIG0

Message Type	Mnemonic	Description
0x3f17		Confirmation of MGT_MSG_L1_CONFIG
0x3f18		Confirmation of MGT_MSG_L1_END
0x5213	SS7_MSG_TRACE_MASK	Set Trace Mask Request
0x526d	ATM_MSG_TRACE_MASK	Set ATM Trace Mask Request
0x5e36	LIU_MSG_R_STATS	LIU Read Statistics Request
0x5e37	LIU_MSG_R_CONFIG	LIU Read Configuration Request
0x5e38	LIU_MSG_R_CONTROL	LIU Read Control Request
0x5e39	LIU_MSG_R_STATE	LIU Read State Request
0x6136	DVR_MSG_R_L1_STATS	Link Statistics Request
0x6214	SS7_MSG_R_STATS	Read Link Statistics Request
0x6215	SS7_MSG_R_STATE	Read Link State Request
0x6263	ATM_MSG_R_STREAM_STATS	Per ATM Cell Stream Statistics
0x6266	ATM_MSG_R_AAL_LINK_STATS	Per Monitored Link Statistics
0x6f0d	MGT_MSG_R_BRDINFO	Read Board Info Request
0x7260	ATM_MSG_CONFIG	Configure ATM
0x7261	ATM_MSG_CFG_STREAM	ATM Cell Stream Configuration
0x7262	ATM_MSG_END_STREAM	Remove ATM Cell Stream Configuration
0x7264	ATM_MSG_AAL_CFG_MON_LINK	Configure AAL Monitor Link
0x7265	ATM_MSG_AAL_END_LINK	Remove AAL Link
0x7267	QSL_MSG_CFG_LINK	Configure Q.SAAL Link
0x7268	QSL_MSG_CFG_TIMERS	Configure Timers per Q.SAAL Link
0x7269	QSL_MSG_END_LINK	Remove Q.SAAL Link
0x7680	SSD_MSG_RESET	SSD Reset Request
0x7681	SSD_MSG_RST_BOARD	Board Reset Request
0x7689	SSD_MSG_BOARD_INFO	Board Information Request
0x7e00	MVD_MSG_RESETSWX	Reset Switch Request
0x7e17	MVD_MSG_SC_LISTEN	Cross Connect Switch Listen Request
0x7e19	MVD_MSG_SC_MULTI_CONNECT	Multiple Connect Request

Message Type	Mnemonic	Description
0x7e1f	MVD_MSG_SC_CONNECT	Connect Request
0x7e34	LIU_MSG_CONFIG	LIU Configuration Request
0x7e35	LIU_MSG_CONTROL	LIU Control Request
0x7f10	MGT_MSG_CONFIG0	Board Configuration Request
0x7f17	MGT_MSG_L1_CONFIG	Layer 1 Configuration Request
0x7f18	MGT_MSG_L1_END	Layer 1 Configuration End
0x8f01	API_MSG_RX_IND (LSL/HSL) API_MSG_RX_IND (ATM)	Received Data Indication
0x8f06	API_MSG_RX_ERR	Received AAL5 Monitoring Error
0xcf00	API_MSG_TX_REQ	MTP2 Transmission Request

4.1.2 Board-specific Module IDs

Table 7 lists the software modules IDs (by mnemonic and value) used on the DSI SS7MD Board.

Table 7. DSI SS7MD Board Software Module IDs

Mnemonic	Value	Description
MGMT_TASK_ID	0x8e	SS7MD Board Management Module
MVD_TASK_ID	0x10	SS7MD LIU and Switch Management Module
SS7_TASK_ID	0x71	MTP2 Module
DVR_ALT_TASK_ID	0x61	Signaling Driver Module
ATM_TASK_ID	0x31	ATM Module
QSL_TASK_ID	0x41	Q.SAAL Module

4.1.3 Message Status Summary

The following table shows the valid responses when a response request (rsp_req) is requested in a message.

Table 8. Message Status Responses

Value	Mnemonic	Description
0x00	SDE_MSG_OK	Success
0x01	SDE_BAD_ID	Inappropriate or invalid id in request message
0x02	SDE_BAD_STATE	Message received in wrong state
0x03	SDE_BAD_SIG	Bad signal received
0x04	SDE_UNEX_SIG	Unexpected signal received
0x05	SDE_BAD_MSG	Unsupported message received
0x06	SDE_BAD_PARAM	Invalid parameters contained in message
0x07	SDE_NO_RESOURCES	Insufficient internal message resources
0x08	SDE_INVALID_NC	Invalid Network Context
0x09	SDE_INVALID_VERSION	Message version is invalid
0x0e	SDE_LICENCE_ERR	Failure due to a licensing restriction
0x0f	SDE_INTERNAL_ERR	Failure due to an internal error

4.2 General Configuration Messages

General configuration messages are typically issued by the s7_mgt protocol configuration utility, in which case they need not, and should not, be generated by any user application software.

The messages in the general configuration category include:

- SSD_MSG_RESET - SSD Reset Request
- SSD_MSG_RST_BOARD - Board Reset Request
- SSD_MSG_BOARD_INFO - Board Information Request
- MGT_MSG_CONFIG0 - Board Configuration Request
- MGT_MSG_L1_CONFIG - Layer 1 Configuration Request
- MGT_MSG_L1_END - Layer 1 Configuration End

4.2.1 SSD_MSG_RESET - SSD Reset Request

Synopsis

Sets up ssd module run-time options at initialization time.

Note: When using the s7_mgt protocol configuration utility, this message is generated by s7_mgt and should not be generated by the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SSD_MSG_RESET (0x7680)
id	0
src	Sending module ID
dst	SSD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	24

PARAMETER AREA		
Offset	**Size**	**Name**
0	3	Reserved. Set to 0.
3	1	mgmt_id
4	18	Reserved. Set to 0.
22	2	num_boards

Description

This message is used during initialization by the application to reset the ssd module and set up its run-time parameters.

The confirmation message (if requested) indicates success with a **status** value of 0.

Parameters

The SSD_MSG_RESET message includes the following parameters:

mgmt_id

The module ID of the management module to which SSD should send board status indications.

num_boards

The maximum number of boards that ssd is required to manage. This should not exceed eight.

4.2.2 SSD_MSG_RST_BOARD - Board Reset Request

Synopsis

Reset a single board and download a code file.

Note: When using the s7_mgt protocol configuration utility, this message is generated by s7_mgt and should not be generated by the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SSD_MSG_RST_BOARD (0x7681)
id	board_id
src	Sending module ID
dst	SSD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	78

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	board_type
2	4	Reserved. Must be set to 0.
6	18	code_file
24	2	run_mode
26	2	options
28	50	code_file_ext

Description

This message is used by the application during initialization (or reconfiguration) to reset a board and download the code file that contains the operating software for the board. The download operation is supervised by the device driver that reads the binary format code file and transfers it to the board.

The confirmation message (if requested) indicates success with a **status** value of 0. This implies that the reset operation has commenced, but does not imply completion. The application should then wait until a Board Status Indication message is received that indicates either successful completion of the reset and download operation or failure during the procedure.

Parameters

The SSD_MSG_RST_BOARD message includes the following parameters:

board_type

The type of board to be reset. This must be set to 16 for DSI SS7MD Boards.

code_file

Null terminated string giving the filename of the code file to be downloaded to the board.

run_mode

The run_mode parameter determines which protocols will be permitted to run on the board. Several modes permit multiple types of link to be used at the same time. The following table shows the permitted values and their meaning:

Value	Run Mode	Protocols Selected to Run on the Board
34	LSL	MTP2 Low Speed Links
35	HSL	MTP2 High Speed Links and/or MTP2 Low Speed Links
36	ATM	ATM links and/or MTP2 High Speed Links and/or MTP2 Low Speed Links
37	IMA	Inverse Multiplexed ATM links

The following combinations of link types are available to the user:

Run Mode	LSL Links	HSL Links	ATM Links	IMA Links
LSL	Y			
HSL	Y	Y		
ATM	Y	Y	Y	
IMA			Y	Y

The number of links that can be run on a board is controlled by the host-based run-time license.

options

- Bit 0 set to 1 to enable SNMP for Board/PCM status
- Other bits reserved for future use, set to 0.

code_file_ext

This parameter contains a string definition of a code file path and name, including a null terminating character.

If the code_file parameter is set to a null value, the code_file_ext parameter will be used. If the code_file parameter is set to a value other than null, this will take precedence and the data in the code_file_ext parameter will be discarded.

4.2.3 SSD_MSG_BOARD_INFO - Board Information Request

Synopsis

Message used to retrieve information about the DSI SS7MD Board.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SSD_MSG_BOARD_INFO (0x7689)
id	board_id
src	Sending module ID
dst	SSD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	38

PARAMETER AREA		
Offset	**Size**	**Name**
0	4	ssdmode
4	2	btype
6	10	Reserved. Must be set to 0.
16	20	sernum
36	1	cur_temp
37	1	max_temp

Description

This message is used when a user application wants to obtain information about a DSI SS7MD Board. This can happen at any time after the board has been reported as being present in the system. Typically, in PCI address mode (see ssdmode below), this message may be sent by the user application to the ssdm module at system startup to determine the serial numbers of boards present within the system.

In the Serial number address mode (see ssdmode below) this message may be sent by the user application to determine the serial numbers of boards present in the system either via their logical geographic address or their physical address (see *Dialogic® Distributed Signaling Interface Components - Software Environment Programmer's Manual*).

Parameters

The SSD_MSG_BOARD_INFO message includes the following parameters:

board_id

The board_id should be set to the logical board number or alternatively, if geographic addressing is enabled, to the board's physical address.

ssdmode

Returns the geographic address mode in which the ssdm module is running. This was specified at system start-up in the system.txt file, for details refer to *Dialogic® Distributed Signaling Interface Components - Software Environment Programmer's Manual* .

The geographic address modes values are:

— 1: PCI address mode

— 2: Serial number address mode

btype

The board type. For DSI SS7MD Boards, this parameter is set to 16.

sernum

The serial number of the board.

cur_temp

Signed 8-bit value containing the current temperature of the board within the range -128 to 127 degrees Celsius.

max_temp

Signed 8-bit value containing the maximum temperature the board has reached since SSDM was last started. Value is within the range -128 to 127 degrees Celsius.

4.2.4 MGT_MSG_CONFIG0 - Board Configuration Request

Synopsis

Message sent to a board immediately after starting the code running to provide physical configuration parameters.

Note: When using the s7_mgt protocol configuration utility, this message is generated by s7_mgt and should not be generated by the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_CONFIG0 (0x7f10)
id	0
src	Sending module ID
dst	MGMT_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	68

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	config_type
2	2	flags
4	2	l1_flags
6	62	Reserved. Must be set to 0.

Description

This message must be the first message sent to the board once the SS7 software is running. It is used to configure layer1 modules on the board for operation. The message contains flags to permit various level 1 configurations. The physical link parameters are configured on a per link basis using the MGT_MSG_L1_CONFIG command.

The confirmation message (if requested) indicates success with a **status** value of 0. To ensure that configuration is complete before subsequent messages are issued to the board, the user should always request a confirmation message and check the status for success.

If the board is not licensed to run the requested software configuration, a **status** value of 0xfe is returned.

Parameters

The MGT_MSG_CONFIG0 message includes the following parameters:

config_type

Set to 3 when using a DSI SS7MD Board. A separate link layer configuration message should be sent for each link using the MGT_MSG_L1_CONFIG message.

flags

Global flags with the following bit significance:

— Bit 15 is set to 1 for diagnostics purposes to cause the results of board configuration to be passed to the host. When set, all confirmation messages generated internally on the board during the configuration sequence are sent to the 0xdf **module ID** on the host.

— All other bits are reserved for future use and should be set to 0.

l1_flags

Level 1 flags with the following bit significance:

— Bit 0 controls the layer 1 clock reference source. If set to 0, the clock is recovered from the onboard oscillator. If set to 1, the clock is recovered from one of the line interfaces. Line interfaces can be individually configured with the LIU_MSG_CONFIG message to explicitly be excluded from recovering the clock from the interface.

— All other bits are reserved and should be set to 0.

4.2.5 MGT_MSG_L1_CONFIG - Layer 1 Configuration Request

Synopsis

Message sent to a board after successful processing of the MGT_MSG_CONFIG0 message to configure the layer 1 links.

Note: When using the s7_mgt protocol configuration utility, this message is generated by s7_mgt and should not be generated by the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_L1_CONFIG (0x7f17)
id	0
src	Sending module's module ID
dst	MGMT_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	40

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	Reserved. Set to 0.
2	2	l1_resource_id
4	2	data_rate
6	2	link_source
8	4	Reserved. Set to 0.
12	2	link_stream
14	2	link_timeslot
16	4	Reserved. Set to 0.
20	4	options
24	4	timeslot_mask
28	12	Reserved. Set to 0.

Description

This message is used after successful processing of the MGT_MSG_CONFIG0 message to configure physical signaling links. It should only be sent after the MGT_MSG_CONFIG0 message has been sent. The message should be sent once for each signaling link to be configured.

Parameters

The MGT_MSG_L1_CONFIG message includes the following parameters:

l1_resource_id

The logical identity of the link set, in the range 0 to one less than the number of link sets supported, The linkset_id is used in other commands for reference

data_rate

Used for setting the link operation. The following table shows the permitted values and their meaning.

Value	Data Rate
0	64 kbits/s
1	56 kbits/s
2	48 kbits/s

link_source

Configure the signaling source.

Set to 0 for DSI SS7MD Board.

link_stream

Signaling stream. This parameter is the physical identity of the T1/E1/J1 line interface containing the signaling link. The value range is 0 to one less than the number of LIUs.

link_timeslot

Signaling timeslot. This field is used to configure conventional SS7 links. The value ranges for **link_timeslot** are 1 to 24 for a T1/J1 interface and 1 to 31 for an E1 interface.

options

A 32-bit value containing run-time options as follows:

— **Bit 0** - Set to 1 to disable automatic FISU generation. This is normally required for Japanese MTP operation only.

— **Bit 1** - Set to 1 to enable onboard time stamping on monitored links. Setting this bit changes the MSG type of the monitor message from API_MSG_RX_IND to API_MSG_RX_INDT. This option is provided for backwards compatibility only.

— **Bit 4** – This bit is used to select the size of the sequence number field. This is necessary in addition to appropriate configuration of the MTP2 layer. The bit is only applicable for HSL operation and should otherwise be set to zero. For HSL operation the bit should be set to 0 for 7-bit sequence numbers or set to 1 for 12-bit sequence numbers.

— **Bit 6** – This bit is used to configure the layer 1 functionality to select between LSL and HSL operation to ensure the appropriate error rate monitoring mechanism is selected. This is necessary in addition to appropriate configuration of the MTP2 layer. The value should be set to 0 for LSL operation and 1 for HSL operation.

— **All Other Bits** - Must be set to 0.

timeslot_mask

Signaling timeslot mask. This field is used to configure HSL links. Bits 0 to 31 of the mask correspond to timeslots 0 to 31 of the signaling stream identified by the **link_stream** parameter. The recommended bits masks values are:

Value	Description
0xfffffffe	structured E1 HSL, 31 slots (1 to 31)
0x01fffffe	structured T1 HSL, 24 slots (1 to 24)
0xfffefffe	structured E1 HSL, 30 slots (1 to 15,17 to 31)

4.2.6 MGT_MSG_L1_END - Layer 1 Configuration End

Synopsis

Message sent to a board to remove an existing layer 1 link that was previously configured by sending an MGT_MSG_L1_CONFIG message.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_L1_END (0x7f18)
id	0
src	Sending module's module ID
dst	MGMT_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	4

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	Reserved. Must be set to 0.
2	2	l1_resource_id

Parameters

The MGT_MSG_L1_END message includes the following parameters:

l1_resource_id

Layer 1 (logical) resource identifier.

4.3 Hardware Control Messages

Hardware control messages are used to control various hardware devices on the board, including the T1/E1/J1 Line Interface Units (LIUs), the digital cross connect switches and the clocking mode for the board.

In a static configuration, these hardware blocks can be set up using the s7_mgt protocol configuration utility along with the appropriate commands in the config.txt protocol configuration file.

If dynamic control of the hardware is required (or the user has elected not to use s7_mgt), the user application must build and send at least some of the hardware control messages.

The messages in the hardware control category include:

- LIU_MSG_CONFIG - LIU Configuration Request
- LIU_MSG_CONTROL - LIU Control Request
- LIU_MSG_R_CONFIG - LIU Read Configuration Request
- LIU_MSG_R_CONTROL - LIU Read Control Request
- MVD_MSG_SC_DRIVE_LIU - LIU Switch Initialization
- MVD_MSG_SC_LISTEN - Cross Connect Switch Listen Request
- MVD_MSG_RESETSWX - Reset Switch Request
- MVD_MSG_SC_CONNECT - Connect Request
- MVD_MSG_SC_MULTI_CONNECT - Multiple Connect Request

4.3.1 LIU_MSG_CONFIG - LIU Configuration Request

Synopsis

Message sent by the application to establish the operating mode for a Line Interface Unit (LIU).

Note: When using the s7_mgt protocol configuration utility, this message is generated by s7_mgt as a result of the LIU_CONFIG command. It therefore need not be generated by the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	LIU_MSG_CONFIG (0x7e34)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	40

PARAMETER AREA		
Offset	**Size**	**Name**
0	1	liu_type
1	1	line_code
2	1	frame_format
3	1	crc_mode
4	1	build_out
5	6	Reserved. Must be set to 0.
11	1	ais_gen
12	6	Reserved. Must be set to 0.
18	1	sensitivity
19	2	clk_options
21	19	Reserved. Must be set to 0.

Description

This message is sent to the board to configure the operating mode of a Line Interface Unit (LIU). All configuration parameters must be supplied in the message, that is, it is not possible to modify individual operating parameters in isolation. On receipt of the message, the board first verifies that the fitted hardware options support the requested operating mode and then initializes (or reinitializes) the LIU.

The confirmation message (if requested) indicates success with a **status** value of 0.

Parameters

A description of the permitted parameter values are given below. When the board is initially configured, the LIUs are initialized to a disabled condition. The message includes the following parameters:

liu_type

The physical interface type according to the following table. The preferred method for configuring an E1 interface is to set a value of 5.

Value	Description
1	Disabled (used to deactivate a LIU). In this mode, the LIU does not produce an output signal.
3	E1 120 ohm balanced interface
4	T1 (including J1)
5	E1 120 ohm balanced interface

line_code

The line coding technique. The following table shows the permitted values and their meanings.

Value	Description
1	HDB3 (E1 only)
2	AMI
4	B8ZS (T1/J1)

frame_format

The frame format. The following table shows the permitted values and their meanings.

Value	Description
1	E1 double frame (E1 only)
2	E1 CRC4 multiframe (E1 only)
3	F4 4-frame multiframe (T1 only)
4	D3/D4 (Yellow alarm = bit 2 in each channel (T1 only)
7	ESF (Yellow alarm in data link channel) (T1 only)
8	F72/SLC96 (72-frame multiframe) (T1 only)
9	J1 frame format (liu_type must be 4 [T1])

crc_mode

The CRC mode. The following table shows the permitted values and their meanings.

Value	Description
1	CRC generation disabled
2	CRC4 enabled (frame_format must be set to 2)
4	CRC6 enabled (frame_format must be set to 7)

build_out

The following table shows the permitted values and their meanings.

Value	Description
0	Setting for E1 devices
1	T1 default (T1 short haul)
2	T1 short haul 0 - 133 ft
3	T1 short haul 133 - 266 ft
4	T1 short haul 266 - 399 ft
5	T1 short haul 399 - 533 ft
6	T1 short haul 533 - 655 ft
7	Not supported.
8	T1 long haul LB0 (-0dB)
9	T1 long haul LB0 (-7.5dB)
10	T1 long haul LB0 (-15dB)
11	Not supported.
12	T1 long haul LBO (-22.5dB)

ais_gen

The (initial) mode used to generate the Alarm Indication Signal (Blue alarm). The user may subsequently modify the setting of the outgoing signal using the LIU_MSG_CONTROL message. The following table shows the permitted values and their meanings.

Value	Description
1	Disabled; do not generate AIS/Blue alarm
2	Enabled; generate AIS/Blue alarm

sensitivity

The mode settings to configure interface sensitivity for monitoring purposes. The following table shows the permitted values and their meanings.

Value	Description
1	Terminated; normal impedance presented on the line
2	High Impedance; set the LIU to high impedance for monitoring (not recommended for new deployments, this mode is provided for backwards compatibility).
4	PMP mode; set the LIU sensitivity to operate with a Protected Monitoring Point.

clk_options

A 16-bit value containing clocking options for the LIU. This value provides the ability to override default LIU clocking options for each LIU. Default options are specified per board within the MGT_MSG_CONFIG0 message.

— Bit 0 - Disable LIU clock recovery for this interface.

— All other bits set to 0.

4.3.2 LIU_MSG_CONTROL - LIU Control Request

Synopsis

Message sent by the application to dynamically control operation for a Line Interface Unit (LIU). Allows setting of outgoing alarms and diagnostic loopbacks.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	LIU_MSG_CONTROL (0x7e35)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	16

PARAMETER AREA		
Offset	**Size**	**Name**
0	1	ais_gen
1	1	Reserved for future use, must be set to 0.
2	1	loop_mode
3	1	Reserved for future use, must be set to 0.
4	1	prbs_gen
5	11	Reserved for future use, must be set to 0.

Description

This message is sent to the board to perform dynamic changes to the operation of the Line Interface Unit (LIU). It allows the user to control the generation of AIS (Blue alarm) and to activate various diagnostic loopback modes. It also allows the configuration of PRBS test sequences.

The confirmation message (if requested) indicates success with a **status** value of 0.

Parameters

The LIU_MSG_CONTROL message includes the following parameters:

ais_gen

The mode used to generate the Alarm Indication Signal (Blue alarm). The following table shows the permitted values and their meanings.

Value	Description
0	Do not change *AIS/Blue alarm generation* mode
1	Disabled; do not generate AIS/Blue alarm
2	Enabled; generate AIS/Blue alarm

loop_mode

The diagnostic *loopback* mode. The following table shows the permitted values and their meanings.

Value	Description
0	Do not change diagnostic *loopback* mode
1	Disabled - remove any diagnostic loop
2	Payload loopback
3	Remote loopback
4	Local loopback

prbs_gen

The Pseudo Random Bit Sequence (PRBS) generation mode. The following table shows the permitted values and their meanings.

Value	Description
0	Do not change *PRBS generation* mode
1	Disabled - remove any PRBS generation
3	Generate PRBS pattern QRSS 20

4.3.3 LIU_MSG_R_CONFIG - LIU Read Configuration Request

Synopsis

Message sent by the application to read back the current Line Interface Unit (LIU) configuration from the board.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	LIU_MSG_R_CONFIG (0x5e37)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	40

PARAMETER AREA		
Offset	**Size**	**Name**
0	40	Parameter area formatted in the same manner as the LIU_MSG_CONFIG message. All fields should be set to 0. The confirmation message contains the board configuration details. The user should set the fields to 0 and the module writes the current configuration parameters in the confirmation message.

Description

This message is sent to the board to read back the current operating configuration of the LIU. The user should always request a confirmation message. The confirmation message indicates success with a **status** value of 0 and contains the current configuration parameters in the parameter area of the message.

4.3.4 LIU_MSG_R_CONTROL - LIU Read Control Request

Synopsis

Message sent by the application to read back the current Line Interface Unit (LIU) control options from the board.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	LIU_MSG_R_CONTROL (0x5e38)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	16

PARAMETER AREA		
Offset	**Size**	**Name**
0	16	Parameter area formatted in the same manner as the LIU_MSG_CONTROL message. All fields should be set to 0. The confirmation message contains LIU control options. The user should set the fields to 0 and the module writes the current control parameters in the confirmation message.

Description

This message is sent to the board to read back the current control parameters selected for a LIU. The user should always request a confirmation message. The confirmation message indicates success when the **status** value of 0 and contains the current control parameters in the parameter area of the message.

4.3.5 MVD_MSG_SC_DRIVE_LIU - LIU Switch Initialization

Synopsis

Sets up a static switch path through the board between a CPU local bus timeslot and a switching channel.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MVD_MSG_SC_DRIVE_LIU (0x7e18)
id	0
src	Sending module's Id
dst	MVD_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	10

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	liu_id
2	2	sc_channel
4	4	ts_mask
8	2	mode

Description

This message is sent to connect selected CPU local bus timeslots from an T1/E1/J1 Line Interface Unit (LIU) or CPU stream to a block of cross connect switch channels. Upon receiving this message, switch channels are prepared to make a cross connect switch connection to outgoing CPU local bus timeslots upon receiving subsequent MVD_MSG_SC_LISTEN messages.

The confirmation message (if requested) indicates success with a **status** value of 0.

Parameters

liu_id

The identifier of the T1/E1/J1 LIU in the range 0 to one less than the number of LIUs. This parameter can be set to a value of a CPU local bus streams in the range of 0x90 upwards, where the number of CPU local bus streams equals one less than the number of LIUs. The timeslot value 0 to 31 in the ts_mask parameter correspond to the signalling processors signaling links.

sc_channel

The logical value of the first switch channel to be used. This should be in the range of 0 to the total number of channels available on the board.

ts_mask

A 32-bit timeslot mask where each bit position represents a local stream timeslot to be connected to the cross connect switch. The least significant bit (bit 0) represents timeslot 0. The arrangement of CPU local bus stream timeslot connections to cross connect switch channels is controlled by the mode parameter.

mode

The mode of operation that controls how the switch channels are allocated. Typically, when mode is set to 1, the first timeslot connected to the switch is connected to the timeslot indicated by sc_channel and each subsequent timeslot that is connected will be connected to the next switch channel. This allows maximum utilization of channels on the switch.

An alternative, with mode set to 2, which should only be used if there is a specific requirement for it, associates (but does not necessarily connect) timeslot 0 on the LIU with the switch timeslot specified by sc_channel and subsequent timeslots on the LIU with subsequent switch channels. Connections are only made when the corresponding bit in the timeslot mask is set to 1. This mode of operation preserves the spacing between timeslots that was originally found on the T1/E1/J1 interface, but does result in a number of switch channels not being used.

4.3.6 MVD_MSG_SC_LISTEN - Cross Connect Switch Listen Request

Synopsis

Establish a connection from an cross connect switch channel to an outgoing timeslot on an T1/E1/J1 Line Interface Unit (LIU).

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MVD_MSG_SC_LISTEN (0x7e17)
id	0
src	Sending module's Id
dst	MVD_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	6

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	liu_id
2	2	timeslot
4	4	sc_channel

Description

This message is sent to the board to establish a connection between a switch channel to an outgoing timeslot on the T1/E1/J1 LIU.

Parameters

liu_id

The identifier of the T1/E1/J1 LIU in the range of 0 to one less than the number of LIUs.

timeslot

The timeslot number of the T1/E1/J1 LIU on which the data from the switch channel will be transmitted. Valid ranges for T1/J1 are 1 to 24 and for E1 are 1 to 31.

sc_channel

The channel number on the switch to which the LIU will listen. This should be in the range of 0 to one less than the total number of channels provided by the cross connect switch.

4.3.7 MVD_MSG_RESETSWX - Reset Switch Request

Synopsis

Resets the digital switch to its default state in accordance with the current board configuration.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MVD_MSG_RESETSWX (0x7e00)
id	0
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	0

Description

This message is sent to the board to reset the state of the digital cross connect switch.

The confirmation message (if requested) indicates success with a **status** value of 0. On receipt of the confirmation message, the operation to reset the switch is completed.

4.3.8 MVD_MSG_SC_CONNECT - Connect Request

Synopsis

Message sent to the board to control the switch path.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MVD_MSG_SC_CONNECT (0x7e1f)
id	0
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	16

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	local_stream
2	2	local_slot
4	2	mode
6	2	source_stream
8	2	source_slot
10	2	dest_stream
12	2	dest_slot
14	2	Reserved. Must be set to 0.

Description

This message is sent to the board to control the cross connect switch. Several different actions can be performed depending on the value of the mode parameter. These include:

- Cross connect switch to CPU local bus stream connection
- Local bus to cross connect switch connection
- Duplex connection between cross connect switch and CPU local bus stream
- Duplex connection between local bus timeslots

Attempting to use this message in a run mode where the cross connect switch is disabled will result in a failure return code.

The confirmation message (if requested) indicates success with a **status** value of 0.

Parameters

The parameters that can be included in the MVD_MSG_SC_CONNECT message depend on the requested mode. The following table depicts the parameters that are required for each possible mode:

Mode	Required Parameters						
	local_ stream	**local_slot**	**source_ stream**	**source_ timeslot**	**dest_ stream**	**dest_ timeslot**	**pattern**
1	*[1]	*[1]	*	*	0	0	0
2	*	*	0	0	*	*	0
3	*[1]	*[1]	*	*	*	*	0
4	*[1]	*[1]	0	0	0	0	0
5	*	*	0	0	0	0	0
6	*[1]	*[1]	0	0	0	0	0
8	*[1]	*[1]	*	*	0	0	0
11	*[1]	*[1]	*	*	0	0	0
12	*[1]	*[1]	*[1]	*[1]	0	0	0
13	*[1]	*[1]	*[1]	*[1]	0	0	0

* indicates that the parameter is required,

[1] indicates that CPU local bus stream values are invalid.

local_stream

Defines which local stream to use for all the modes of operation. The local_stream parameter specifies either a T1/E1/J1 Line Interface Unit (LIU) or CPU local bus stream. Values for the LIU are in the range 0 to one less than the number of LIUs supported. CPU local bus stream values are in the range 0x90 upwards, the number of CPU local bus streams are one less than the number of LIUs supported.

local_slot

Defines which timeslot on the local stream to use for all the modes of operation. The local slot value has different valid ranges depending on the local stream type. The following table shows the permitted values and their meanings.

Local Stream Type	Local Slot Range
Local stream to E1 LIU	1 to 31
Local stream to T1 LIU	1 to 24
Local stream to CPU	1 to 31

mode

Determines the operating mode. The following table shows the permitted values and their meanings.

Value	Meaning
1	Make a simplex connection from a timeslot on the cross connect switch to a timeslot on the local bus. Use the local_stream, local_slot, source_stream, and source_slot parameters to specify the local and switch timeslots, respectively.
2	Make a simplex connection from a timeslot on the CPU local bus stream to a timeslot on the cross connect switch. Use the local_stream, local_slot, dest_stream, and dest_slot parameters to specify the local and switch timeslots, respectively.
3	Make a duplex connection between a CPU local bus stream timeslot and two cross connect switch timeslots. Use the local_stream, local_slot, source_stream, and source_slot parameters to specify one simplex connection; and the local_stream, local_slot, dest_stream, and dest_slot parameters to specify the other simplex connection.
4	Remove a simplex connection from a timeslot on the cross connect switch to a timeslot on the CPU local bus. Use the local_stream and local_slot parameters to specify the timeslot for disconnection.
5	Remove a simplex connection from a timeslot on the CPU local bus to a timeslot on the cross connect. Use the local_stream and local_slot parameters to specify the timeslot for disconnection.
6	Remove a duplex connection between two timeslots on the cross connect switch and one timeslot on the CPU local bus. Use the local_stream and local_slot parameters to specify both timeslots for disconnection.
8	Remove a connection between a switch timeslot and a CPU local bus timeslot. Then create a simplex connection between the same CPU local bus timeslot back to the switch timeslot. Use the local_stream and local_slot parameters to specify the CPU local bus timeslot, and the source_stream and source_timeslot to specify the switch timeslot.
11	Make a simplex connection between two CPU local bus timeslots. The source_stream and source_slot parameters specify the source of the signal in terms of liu_id and timeslot, respectively. The local_stream and local_slot parameters specify the outgoing lLIU or CPU stream and timeslot, respectively.
12	Make a duplex connection between two CPU local bus timeslots. The source_stream and source_slot parameters specify the source of the signal in terms of liu_id and timeslot, respectively. The local_stream and local_slot parameters specify the outgoing liu_id and timeslot, respectively
13	Remove a duplex connection between two CPU local bus timeslots. Use the local_stream and local_slot parameters to specify one timeslot and the source_stream and source_slot parameters to specify the other.

source_stream

The source_stream references the cross connect switch streams that should be used as a source for data. The parameter takes values in the range of 0 to 31. For some modes (for example, 11 and 12), this field is used to specify a local stream instead of a switch stream.

source_slot

The source slot references the timeslot from which to connect or disconnect to the cross connect switch stream. The source slot values are in the range 0 to 127.

dest_stream

The dest_stream references the cross connect switch streams that should be used as a destination for data. The parameter takes values in the range of 0 to 31.

dest_slot

The dest slot references the timeslot from which to connect or disconnect to the cross connect switch stream. The dest slot values are in the range of 0 to 127.

4.3.9 MVD_MSG_SC_MULTI_CONNECT - Multiple Connect Request

Synopsis

Message sent to the board to control the switch to connect multiple paths.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MVD_MSG_SC_MULTI_CONNECT (0x7e19)
id	0
src	Sending module ID
dst	MVD_module_ID
rsp_req	May be used to request a confirmation.
hclass	0
status	0
err_info	0
len	18

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	local_stream
2	4	timeslot_mask
6	2	mode
8	2	source_st
10	2	source_ts
12	6	Reserved. Must be set to 0.

Description

This message is sent to the board in order to control the configuration of the cross connect switch for more complex configurations.

Parameters

The MVD_MSG_SC_MULTI_CONNECT message includes the following parameters:

local_stream

The logical reference of the local stream that the message relates to, that is, 0 to one less than the number LIUs corresponding to the liu_id.

timeslot_mask

A 32-bit mask representing up to 32 timeslots on the local stream. Bit 0 corresponds to timeslot 0. A 1 in the mask indicates that the pattern should be output on this timeslot, a 0 indicates that it should be left unchanged.

mode

The mode of operation. The following table shows the permitted values and their meaning.

Value	Description
1	Make a simplex connection between an cross connect switch timeslot and a local LIU stream. Use the local_stream and timeslot_mask to specify the target destination on the CPU local bus. The source_st and source_ts.
11	Make a simplex connection between two CPU local bus stream timeslots. The source_st and source_ts parameters specify the source of the signal in terms of liu_id or CPU local bus stream reference and timeslots, respectively. The local_stream relates to the outgoing liu_id stream and cannot reference a CPU local bus stream. The timeslot_mask parameters specify the outgoing timeslots to which the source will be connected.

source_st, source_ts

When **mode** is set to 11, these parameters give the source_st and source_ts for connection to the specified local timeslots. For other modes the source_st and source_ts specify the cross connect switch stream and timeslot, respectively.

4.4 Signaling Interface Messages

Signaling interface messages allow signaling links to be activated and deactivated by the user and provide a mechanism for communication between the MTP3 module and the user part module (for example, ISUP or SCCP). In many cases, the user part module is an Dialogic® DSI Protocol Stack so the user does *not* need to handle the MTP primitives as they pass directly between MTP3 and the user part module.

In the case that the user application is implementing the user part functionality, the MTP primitives are applicable. See the *MTP2 Programmer's Manual* and the *MTP3 Programmer's Manual* for more information.

The messages in the Signaling interface category include:

- API_MSG_RX_IND - Received Data Indication
- API_MSG_TX_REQ - MTP2 Transmission Request

4.4.1 API_MSG_RX_IND - Received Data Indication

Synopsis

Message sent from MTP2 to MTP3 containing valid received Message Signal Units (MSU). This message may be visible to the user when tracing is enabled. The message is also used when monitoring LSL or HSL to convey the received MSU to the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	API_MSG_RX_IND (0x8f01)
id	l3_link_id
src	MTP2 module ID/
dst	Links upper module ID
rsp_req	0
hclass	0
status	0
err_info	0
next	0
len	Number of octets in the received frame

PARAMETER AREA		
Offset	**Size**	**Name**
0	len	For terminated operation when the message is passed between MTP2 and MTP3 this field contains the MSU data in binary commencing with the Service Information Octet (SIO) and formatted in accordance with Q.703. For monitored LSL & HSL this field contains the full Signal Unit commencing with the layer 2 header and formatted in accordance with Q.703. This field does not include the CRC.

Description

Message generated by MTP2 containing the Signaling Unit data received on the specified link. Note that ATM monitoring the format of the parameter area is different and this is described in section 4.5.4 API_MSG_RX_IND - Received AAL5 Monitoring Data Indication

4.4.2 API_MSG_TX_REQ - MTP2 Transmission Request

Synopsis

Message issued to the board by MTP3, containing an SS7 Message Signal Unit (MSU) for transmission on the specified link.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	API_MSG_TX_REQ (0xcf00)
id	l2_llid
src	Sending module ID
dst	MTP2 module ID
rsp_req	Sending layers bit set if response is required.
hclass	0
status	0
err_info	0
len	Number of octets in the Signaling Unit.

PARAMETER AREA		
Offset	**Size**	**Name**
0	len	Signaling Unit (SU) data in binary format commencing with the SIO.

Description

Message issued to the board by MTP3 containing an SS7 Message Signal Unit (MSU) for transmission on the specified link.

4.5 ATM Interface Messages

ATM Interface Messages allow management of ATM Cell Streams and configuration of Monitoring for AAL5 links. The following messages are supported:

- ATM_MSG_CONFIG - Configure ATM
- ATM_MSG_CFG_STREAM - ATM Cell Stream Configuration
- ATM_MSG_END_STREAM - Remove ATM Cell Stream Configuration
- API_MSG_RX_IND - Received AAL5 Monitoring Data Indication
- API_MSG_RX_ERR - Received AAL5 Monitoring Error
- ATM_MSG_R_STREAM_STATS - Per ATM Cell Stream Statistics
- ATM_MSG_AAL_CFG_MON_LINK - Configure AAL Monitor Link
- ATM_MSG_AAL_END_LINK - Remove AAL Link
- ATM_MSG_R_AAL_LINK_STATS - Per Monitored Link Statistics
- ATM_MSG_STREAM_STATE - ATM Stream Status Indication
- ATM_MSG_LINK_STATE –AAL Link Status Indication
- ATM_MSG_TRACE_MASK - Set Trace Mask Request

4.5.1 ATM_MSG_CONFIG - Configure ATM

Synopsis

Message sent to the ATM module to configure per module information.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_CONFIG (0x7260)
id	0
src	Management module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Message status code
err_info	0
len	38

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	options
2	2	num_streams
4	2	vpi_mask
6	32	vci_mask

Description

This message is sent to each board that needs to run ATM protocols to initialize all per module options. It must be the first message sent to the module.

Parameters

The ATM_MSG_CONFIG message includes the following parameters:

options

Bit	Description
0	Use ATM Forum Idle cell format rather than ITU.
1	Use vpi and vci masks supplied rather than default masks of 0x00f (vpi) and 0x01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff 01ff (vci)
Others	Reserved for future use. Must be set to 0.

num_streams

The maximum number of cell streams the on-board ATM module is required to simultaneously support.

Each cell stream is treated independently of the link bandwidth it consumes.

For an IMA bundle, each TDM stream within the bundle is counted separately.

vpi_mask

This bitmask is required when the option bit is set for full configuration via masks, rather than use the default mask (0x000f), which allows vpi values 0 to 15 inclusive to be used. The vpi and vci cannot both be 0.

vci_mask

These bitmasks are required when the option bit is set for full configuration via 16 vci mask - one for each (of up to 16) vpi values configured. The default mask (0x01ff) allows vci values from 0 to 511 inclusive to be used, although 0, 3, and 4 are reserved.

If fewer ports are being configured, then masks allowing more vpi/vci combinations may be used.

Note: The number of vpi/vci combinations per cell stream multiplied by the number of cell streams configured must not exceed 64 kbits/s.

Note: The vpi/vci mask is selected on a per board basis. Different masks may be used for each board.

4.5.2 ATM_MSG_CFG_STREAM - ATM Cell Stream Configuration

Synopsis

Message used to configure an ATM cell stream.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_CFG_STREAM (0x7261)
id	Cell Stream ID
src	Management module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Message status code
err_info	0
len	22

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	options
2	2	ima_frame_len
4	2	max_frame_len
6	2	default_vpi
8	2	default_vci
10	2	tdm_stream
12	4	tdm_timeslots
16	1	mgmt_id
17	2	upper_stream_id
19	3	Reserved. Set to 0.

Description

Processed by the module (once a module configuration message has been correctly processed) to configure and activate an ATM cell stream (whether single TDM or IMA bundle).

For the configuration of IMA bundles, TDM resources cannot be dynamically added or removed from an active IMA bundle. To increase the bandwidth available via an IMA bundle, the bundle should be be removed and re-added.

The confirmation message (if requested) indicates success with a **status** value of 0.

Cell Stream ID

The logical Cell Stream ID from the ATM module's perspective

Parameters

The ATM_MSG_CFG_STREAM message includes the following parameters:

options

Bit	Mnemonic	Description
0	ATM_CFG_OPTIONS_SCRAMBLE	Enable payload scrambling
1	ATM_CFG_OPTIONS_COSET	Use ATM coset in HEC calculation
2	ATM_CFG_OPTIONS_AUTOCORRECT	Autocorrect invalid cells if possible
3	ATM_CFG_OPTIONS_IMA_BUNDLE	Configuration describes an IMA bundle

Note: Either Payload Scrambling or ATM Coset mode, or both, must be enabled for correct operation. Configurations which disable both options will be rejected.

ima_frame_len

The length of the IMA frame.

Value	Mnemonic	Description
1	ATM_CFG_IMA_FRAME_32	32 cells per IMA frame
2	ATM_CFG_IMA_FRAME_64	64 cells per IMA frame
3	ATM_CFG_IMA_FRAME_128	128 cells per IMA frame
4	ATM_CFG_IMA_FRAME_256	256 cells per IMA frame

Note: For non IMA streams this field is reserved and should be set to zero.

max_frame_len

The maximum length of a reassembled (AAL) frame. Frames longer than this will be discarded by the ATM layer.

Note: The maximum AAL frame length accepted at the ATM layer is determined by the requirements of the full protocol stack. At present, the requirements of the MTP3 layer and above are support for signaling units with a SIF length of less than or equal to 272 octets. MTP3-b (and subsequently Q.2140 / Q.2110) allow frames of up to 4K octets. If a peer sends a data frame longer than the maximum frame length parameter, the ATM layer will discard the frame and all retransmissions resulting in the Q.SAAL link being taken out of service.

default_vpi

A default AAL5 link will be configured for the cell stream to signal incoming active connections. This is the vpi that will be used for this connection. The vpi must be available in the mask configured in the ATM_MSG_CONFIG message.

default_vci

A default AAL5 link will be configured for the cell stream to signal incoming active connections. This is the vci that will be used for this connection. Values 0, 3, and 4 are reserved and should not be used and the vci value must be viable in the mask specified in the ATM_MSG_CONFIG message.

Note: The default vpi/vci combination configured here must not be specified for any AAL5 link on this cell stream.

tdm_stream

TDM streams to be used by the cell stream.

If IMA is active, the parameter is a bitmap of the TDMs to be used by the bundle (bit 0 = TDM 0, etc.).

If IMA is not active, the parameter identifies the TDM to be used.

tdm_timeslot

Bitmap of active timeslots within the above TDM streams.

The timeslots are dependent on the LIU configuration. Typically, the timeslot bitmap for E1 will be 0xfffefffe and for T1/J1 will be 0x01fffffe.

mgmt_id

ID of management module for status updates.

upper_stream_id

Upper layer (layer 3) stream identifier – this is a logical identifier from the upper layer for the cell stream and is not board specific.

4.5.3 ATM_MSG_END_STREAM - Remove ATM Cell Stream Configuration

Synopsis

Message used to remove an active ATM cell stream.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_END_STREAM (0x7262)
id	Cell Stream ID
src	Sending module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Message status code
err_info	0
len	0

Description

Sent by the user to stop processing on a previously configured ATM cell stream.

Once successfully processed, the link may be reconfigured. The confirmation message (if requested) indicates success with a **status** value of 0.

4.5.4 API_MSG_RX_IND - Received AAL5 Monitoring Data Indication

Synopsis

Message generated by ATM module when operating in AAL5 monitoring mode to convey received frames to the user.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	API_MSG_RX_IND (0x8f01)
id	upper_id
src	ATM module ID
dst	user module ID
rsp_req	0
hclass	0
status	0
err_info	0
next	0
len	Length of SU data plus 2.

PARAMETER AREA		
Offset	**Size**	**Name**
0	len - 2	SU Data - Received MSU data in binary format commencing with the Service Information Octet (SIO) and formatted as defined in Q.2110.
len - 2	1	UUI - User to User Indication
len - 1	1	CPI - Common Part Indicator

Description

Message generated by ATM containing the Signaling Unit data received on the specified link.

4.5.5 API_MSG_RX_ERR - Received AAL5 Monitoring Error

Synopsis

Message generated by ATM module (when operating in AAL5 monitoring mode and tracing is enabled) on receipt of an errored frame. The Status field indicates the error type.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	RX_ERR (0x8f06)
id	upper_id
src	ATM module ID
dst	user module ID
rsp_req	0
hclass	0
status	See description below
err_info	0
next	0
len	Length of the received data plus 2.

PARAMETER AREA		
Offset	**Size**	**Name**
0	len - 2	Received data formatted in the same manner as for the API_MSG_RX_IND message.
len - 2	1	UUI - User to User Indication
len - 1	1	CPI - Common Part Indicator

Description

Message generated by ATM, if tracing is enabled, indicating that an errored frame has been received.

Status

Error code returned in the status field.

Value	Mnemonic	Description
0x00	ATM_RX_ERR_UNDEFINED	Frame error detected which is not specified below
0x01	ATM_RX_ERR_INTERNAL	Frame errored due to internal resources
0x02	ATM_RX_ERR_TRUNC	Frame larger than can be handled internally
0x03	ATM_RX_ERR_CRC	Frame fails AAL5 trailer CRC32 check
0x04	ATM_RX_ERR_LENGTH	Frame length differs from that indicated by the AAL5 trailer
0x05	ATM_RX_ERR_ABORT	Frame was aborted during transmission (AAL5 trailer length equal to zero)

Parameters

The parameter area for the RX_ERR message is formatted exactly as for the API_MSG_RX_IND message.

4.5.6 ATM_MSG_R_STREAM_STATS - Per ATM Cell Stream Statistics

Synopsis

Message used to retrieve and optionally reset per cell stream statistics.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_R_STREAM_STATS (0x6263)
id	Cell Stream ID
src	Sending module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Used to reset the statistics
err_info	0
len	36

PARAMETER AREA		
Offset	**Size**	**Name**
0	4	period
4	4	rx_frames
8	4	rx_octets
12	4	rx_discards
16	4	rx_errors
20	4	tx_frames
24	4	tx_octets
28	4	tx_discards
32	4	tx_errors

Description

Sent by the user to request (and optionally reset) the statistics for the cell stream. The values returned are the totals for all the links using this cell stream.

The confirmation message (if requested) indicates success with a **status** value of 0.

Cell Stream ID

The logical Cell Stream ID.

status

Set to one if statistics should be reset once read.

Parameters

The ATM_MSG_R_STREAM_STATS has the following parameters:

period

Period since last reset in units of 100 ms.

rx_frames
Number of valid AAL5 frames received.

rx_octets
Number of data octets received.

rx_discards
Number of received AAL5 frames discarded.

rx_errors
Number of frames with errors received.

tx_frames
Number of valid AAL5 frames sent.

tx_octets
Number of data octets sent.

tx_discards
Number of sent AAL5 frames discarded.

tx_errors
Number of transmit errors.

4.5.7 ATM_MSG_AAL_CFG_MON_LINK - Configure AAL Monitor Link

Synopsis

Message used to configure AAL5 monitoring for a specific vpi/vci combination on an existing ATM cell stream.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_AAL_CFG_MON_LINK (0x7264)
id	link_id
src	Sending module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Message status code
err_info	0
len	16

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	options
2	2	upper_link_id
4	2	cell_stream
6	1	upper_mod_id
7	2	vpi
9	2	vci
11	1	mgmt_id
12	1	trace_id
13	3	Reserved. Set to 0.

Description

Sent (after configuration of the ATM cell stream) by the user to configure the parameters of an AAL5 monitored link.

The vpi/vci combination configured here must not match the default specified for the cell stream.

Immediately following receipt of this message, generation of API_MSG_RX_IND messages towards the 'upper_mod_id' will commence.

AAL5 messages of length greater than the maximum configured for the underlying cell stream will be silently discarded. A count of discards may be retrieved via an ATM statistics request: ATM_MSG_R_STREAM_STATS.

link_id

Identifier for this link.

Note: This identifier is required to be unique only within the context of the board.

Parameters

The ATM_MSG_AAL_CFG_MON_LINK has the following parameters:

options

Bit	Meaning
0	Monitor an AAL5 stream
1	Enable timestamping. When enabled, received messages are passed to the user using the API_MSG_RX_INDT message. Otherwise the API_MSG_RX_IND message is used. This option is provided for backwards compatibility and is not recommended for new designs.
Others	Reserved for future use and must be set to 0.

upper_link_id

Upper layer link identifier

cell_stream

The identity of the cell stream that will be monitored.

upper_mod_id

The recipient module ID for the monitored link.

vpi

The vpi of the AAL5 stream to be monitored. The vpi must be viable in the mask configured in the ATM_MSG_CONFIG message.

vci

The vci of the AAL5 stream to be monitored. The vci value must be viable in the mask specified in the ATM_MSG_CONFIG message. Values 0, 3, and 4 are reserved.

mgmt_id

ID of management module .

trace_id

ID of trace module for trace messages.

4.5.8 ATM_MSG_AAL_END_LINK - Remove AAL Link

Synopsis

Message used to terminate and remove the configuration of a monitoring link.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_AAL_END_LINK (0x7265)
id	link_id
src	Sending module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Message status code
err_info	0
len	0

Description

Sent by the user to deactivate a monitoring link, remove its connection from the underling ATM cell stream, and release its resources.

link_id

Identifier for this link. The confirmation message (if requested) indicates success with a **status** value of 0.

4.5.9 ATM_MSG_R_AAL_LINK_STATS - Per Monitored Link Statistics

Synopsis

Message used to retrieve (and reset) per monitored link statistics.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_R_AAL_LINK_STATS (0x6266)
id	link_id
src	Sending module ID
dst	ATM_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	Used to reset statistics
err_info	0
len	16

PARAMETER AREA		
Offset	**Size**	**Name**
0	4	period
4	4	rx_frames
8	4	CRC_errors
12	4	oversized_SDUs

Description

Sent by the user to request (and optionally reset) the statistics for the specified AAL link. The confirmation message (if requested) indicates success with a **status** value of 0.

link_id
Identifier for this link.

status
Set to one if statistics should be reset once read.

Parameters

The ATM_MSG_R_AAL_LINK_STATS has the following parameters:

period
Period since last reset in units of 100 ms.

rx_frames
Total number of valid frames received on the link.

CRC_errors
Total number of CRC errors that have occurred on the link

oversized_SDUs
Total number of oversized SDU errors that have occurred.

4.5.10 ATM_MSG_STREAM_STATE - ATM Stream Status Indication

Synopsis

Primitive generated by ATM to advise management of changes to the stream state.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_STREAM_STATE (0x026a)
id	Cell Stream ID
src	ATM_Task_ID
dst	Management Module ID
rsp_req	0
hclass	0
status	Stream state (see table below)
err_info	Timestamp
len	0

Description

Sent by the ATM module when a stream becomes active or inactive

Value	Mnemonic	State
1	CELL_STREAM_IN_SERVICE	Entered IN SERVICE state
2	CELL_STREAM_OUT_SERVICE	Entered OUT OF SERVICE state

4.5.11 ATM_MSG_LINK_STATE –AAL Link Status Indication

Synopsis

Primitive generated by AAL to advise management of changes to the link state.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_LINK_STATE (0x026b)
id	link_id
src	ATM Module ID
dst	Management Module ID
rsp_req	0
hclass	0
status	Stream state (see table below)
err_info	Timestamp
len	0

Description

Sent by the ATM module when an AAL link becomes active or inactive. If the rate of received messages falls below a fixed threshold of 10 messages per second the link is deemed to be out of service. Under normal operating conditions the link management messages will ensure that traffic exceeds this rate.

Value	Mnemonic	State
1	AAL_IN_SERVICE	Entered IN SERVICE state
2	AAL_OUT_SERVICE	Entered OUT OF SERVICE state

4.5.12 ATM_MSG_TRACE_MASK - Set Trace Mask Request

Synopsis

Message issued to ATM module to set the mask on which messages should be traced

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	ATM_MSG_TRACE_MASK (0x526d)
id	Link ID
src	User Module ID
dst	ATM_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	6

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	op_evt_mask
2	2	ip_evt_mask
4	2	Reserved. Set to 0.

Description

The ATM module supports comprehensive tracing options when monitoring links on a per-link and per-primitive basis. The module can be configured to trace any message received or transmitted and a number of management events. This message is used to selectively enable tracing of events. It can be used at any time during operation and continues to be effective until the next Trace Mask Set Request is received for the same link.

Traced events are indicated to the management module using the Trace Event Indication (MGT_MSG_TRACE_EV).

Parameters

The ATM_MSG_TRACE_MASK message includes the following parameters:

op_evt_mask

The output event trace mask. This is a 16-bit value with bits set to 1 to cause a trace message to be sent to the management module whenever a message is issued by ATM. Care should be taken when tracing messages because the system throughput may be reduced. The fields in the trace mask cause the events indicated in the table below to be traced..

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
0	0	0	0	0	0	0	0
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	0	0	0	0	0	0	RXD_MSG
Key: o RXD_MSG – ATM Received message indication							

ip_evt_mask

The input event trace mask. This is a 16-bit value with bits set to 1 to cause a trace message to be sent to the management module whenever a message is received by ATM. Care should be taken when tracing messages, as system throughput may be reduced. The fields in the trace mask cause the events indicated in the table below to be traced.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
0	0	0	0	0	0	0	0
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	RX_ERR	0	0	0	TM_EXP	RX_IND	0
Key: o RX_IND - ATM Received message indication o TM_EXP - ATM Timer Expired indication o RX_ERR - ATM Receiver Error							

4.6 Q.SAAL Interface Messages

Q.SAAL Interface Messages allow Q.SAAL links to be configured, activated, and deactivated by the user.

The list of management requests sent to Q.SAAL includes:

- QSL_MSG_CFG_LINK - Configure Q.SAAL Link
- QSL_MSG_CFG_TIMERS - Configure Timers per Q.SAAL Link
- QSL_MSG_END_LINK - Remove Q.SAAL Link
- SS7_MSG_TRACE_MASK - Set Trace Mask Request (Q.SAAL)
- SS7_MSG_R_STATE - Read Link State Request (Q.SAAL)
- SS7_MSG_R_STATS - Read Link Statistics Request (Q.SAAL)
- MGT_MSG_QSL_EVENT - Q.SAAL Event Indication
- MGT_MSG_SS7_STATE - Link State Indication (Q.SAAL)

4.6.1 QSL_MSG_CFG_LINK - Configure Q.SAAL Link

Synopsis

Message issued by management to configure an individual Q.SAAL link for operation.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	QSL_MSG_CFG_LINK (0x7267)
id	Link ID
src	User Module ID
dst	QSL_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	46

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	options
2	2	upper_link_id
4	2	cell_stream
6	1	upper_mod_id
7	2	vpi
9	2	vci
11	1	mgmt_id
12	1	lower_mod_id
13	2	max_SIF_len

15	2	cong_onset
17	2	cong_abate
19	2	cong_discard
21	2	MaxCC
23	2	MaxPD
25	2	n1
27	2	co1
29	2	co2
31	2	co3
33	2	ca1
35	2	ca2
37	2	ca3
39	2	cd1
41	2	cd2
43	2	cd3
45	1	trace_id

Description

This message is used to configure the operational parameters for an individual Q.SAAL link and to cause the power up action defined in Q.2140/Q.2110 to be executed. One such message must be issued to Q.SAAL for each link to be used. The QSAAL_MSG_TIMERS message can be used to modify timer values.

The vpi/vci combination configured here must not match the default specified for the cell stream.

Once the message has been received and processed by the Q.SAAL module, API_MSG_RX_IND messages will immediately get sent to the module ID indicated (with the ID field set to the upper_link_id).

Messages of length greater than the maximum configured for the underlying cell stream will be silently discarded. A count of discards may be retrieved via an ATM stats request ATM_MSG_R_STREAM_STATS.

link_id

Identifier for this link.

Note: This identifier is required to be unique only within the context of the board.

Options

Bit	Options
1	Set to 1 to enable multiple congestion states and multiple message priority option. This option should always be enabled when running in ANSI mode.
Others	Reserved for future use and must be set to 0.

upper_link_id

Upper layer link identifier

cell_stream

The identity of the cell stream over which this link will run.

upper_mod_id

The recipient module ID for the link.

vpi

The vpi of the AAL5 stream to use. The vpi must be viable in the mask configured in the ATM_MSG_CONFIG message.

vci

The vci of the AAL5 stream to use. The vci value must be viable in the mask specified in the ATM_MSG_CONFIG message. Values 0, 3 and 4 are reserved.

mgmt_id

Id of Management module for status updates

lower_mod_id

The module ID for the lower level ATM module

max_SIF_len

The maximum length of Signaling Information Field (SIF) to support. This should be set typically to 272 but may be set lower if required.

cong_onset

The congestion onset threshold for use with the single congestion threshold mode of operation. Congestion is indicated when the total number of messages in the transmit and retransmit buffers rises to this value.

cong_abate

The congestion abatement threshold for use with the single congestion threshold mode of operation. Link uncongested is indicated when the total number of messages in the transmit and retransmit buffers falls below this value.

cong_discard

The congestion discard threshold for use with the single message priority mode of operation. When the combined number of messages in the transmit and retransmit buffers reaches this threshold, further messages are discarded. The congestion discard threshold cannot be set to a value greater than 4095.

MaxCC

Number of retransmissions on connection establishment and release request. Typically this should be set to Q.2140 default value 4.

MaxPD

Maximum number of SD PDUs sent between polls. Typically this should be set to Q.2140 default value 500.

n1

Number of proving PDUs sent during proving.

co1, co2, co3, ca1, ca2, ca3, cd1, cd2, cd3

Congestion onset, abatement and discard thresholds for use when the Multiple Congestion Thresholds mode of operation is selected.

The following relationships must be true:

ca1 <= co1 <= ca2 <= co2 <= ca3 <= co3

and

co1 <= cd1 <= co2 <= cd2 <= co3 <= cd3.

trace_id

ID of trace module for trace messages. If the trace_id field is zero, then all trace messages, for that link, are sent to the management ,module

4.6.2 QSL_MSG_CFG_TIMERS - Configure Timers per Q.SAAL Link

Synopsis

Configure timers for an individual Q.SAAL Link - otherwise default timer values will be used

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	QSL_MSG_CFG_TIMERS (0x7268)
id	Link ID
src	User Module ID
dst	QSL_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	32

PARAMETER AREA		
Offset	**Size**	**Name**
0	4	cc
4	4	keep_alive
8	4	no_resp
12	4	poll
16	4	idle
20	4	t1
24	4	t2
28	4	t3

Description

QSAAL_MSG_CFG_LINK messages may be issued to the Q.SAAL module to modify timer configuration parameters. Otherwise default timer values will be used.

Timer ID	Default Value (ms)	Range (min - max)
cc	1500	15 - 2,500
keep_alive	300	15 - 2,500
no_resp	1500	100 - 10,000
poll	100	20 - 600
idle	100	20 - 600
t1	5000	1,000 - 20,000
t2	120000	10,000 - 300,000
t3	10	1 - 30

cc
Time between transmission of un-ack'ed BGN, END, ER, RS PDUs

keep_alive
Time between keep alive messages.

no_resp
Time interval during which a STAT PDU must be received, otherwise the link has failed

poll
Poll timer interval

idle
Maximum Idle phase time of an SSCOP connection

t1
Time between link release and link re-establishment during alignment.

t2
Maximum time to attempt link alignment.

t3
Time between proving PDUs.

Note: The timers are specified in milliseconds.

4.6.3 QSL_MSG_END_LINK - Remove Q.SAAL Link

Synopsis

Remove a Q.SAAL Link - only allowed when the link is in the inactive state.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	QSL_MSG_END_LINK (0x7269)
id	Link ID
src	User Module ID
dst	QSL_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

Description

Sent by the user to deactivate a link, remove its connection from the underling ATM cell stream and release its resources.

link_id

Identifier for this link.

4.6.4 SS7_MSG_TRACE_MASK - Set Trace Mask Request (Q.SAAL)

Synopsis

Message issued to Q.SAAL module to set the mask of which messages should be traced

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SS7_MSG_TRACE_MASK (0x5213)
id	Link ID
src	User Module ID
dst	QSL_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	6

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	op_evt_mask
2	2	ip_evt_mask
4	2	mgmt_evt_mask

Description

The Q.SAAL module supports comprehensive tracing options on a per-link and per-primitive basis. The module can be configured to trace any message received or transmitted and a number of management events. This message is used to selectively enable tracing of events. It can be used at any time during operation and continues to be effective until the next Trace Mask Set Request is received for the same link.

Traced events are indicated to the management module using the Trace Event Indication (MGT_MSG_TRACE_EV).

Parameters

The SS7_MSG_TRACE_MASK message includes the following parameters:

op_evt_mask

The output event trace mask. This is a 16-bit value with bits set to 1 to cause a trace message to be sent to the management module whenever a message is issued by Q.SAAL. Care should be taken when tracing messages because the system throughput may be reduced. The fields in the trace mask cause the events indicated in the table below to be traced.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
RTVL FAIL	0	LINK UNCONG	LINK CONG	0	0	0	0
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
RTVL COMPL	RTVD MSG	RXD BSNT	0	0	OUT SVC	IN SVC	RXD MSG
Key: o RTVL_FAIL - Retrieval not possible indication o LINK_UNCONG - Link uncongested indication o LINK_CONG - Link congested indication				o RTVL_COMPL - Retrieval Complete indication o RTVD_MSG - Retrieved message indication o RXD_BSNT - Received BSNT indication o OUT_SVC - Out of service indication o IN_SVC - In service indication o RXD_MSG - Received message indication			

ip_evt_mask

The input event trace mask. This is a 16-bit value with bits set to 1 to cause a trace message to be sent to the management module whenever a message is received by Q.SAAL. Care should be taken when tracing messages, as system throughput may be reduced. The fields in the trace mask cause the events indicated in the table below to be traced.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
0	0	FLUSH	LPO CLRD	LPO	RTVL REQ	RTV BSNT	EMGCY CLRD
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
EMGCY	0	STOP	START	0	0	0	MSG FOR TX
Key: o FLUSH - Continue request and Flush request o LPO CLRD - Local processor outage ceases indication o LPO - Local processor outage indication o RTVL_REQ - Retrieval request o RTV_BSNT - Retrieve BSNT request o EMGCY_CLRD - Emergency cleared indication				o EMGCY - Emergency indication o STOP - Stop request o START - Start request o MSG_FOR_TX - Message for transmission request			

mgmt_evt_mask

The management event trace mask. This is a 16-bit value with bits set to 1 to cause an event indication message to be sent to the management module for the events shown. The fields in the trace mask cause the events indicated in Figure 4 on page 110 to be traced. By default, the SL_FAIL, SL_CONG, ERROR and STATE bits are set. Note: Take care when sending trace mask set requests. Failure to set bits 0, 1 2 and 3 prevents the generation of MGT_MSG_SS7_STATE state change indications and MGT_MSG_SS7_EVENT Q.791 event indications.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
0	0	0	0	0	0	0	0
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	0	SL_PROV	SL_TEXP	SL_CONG	SL_FAIL	ERROR	STATE

Key:
- o SL_PROV - Proving errors
- o SL_TEXP - Timer expired
- o SL_CONG - Report Q.791 congestion events
- o SL_FAIL - Report Q.791 reasons for link failure
- o ERROR - Report errors
- o STATE - Trace changes of link state

4.6.5 SS7_MSG_R_STATE - Read Link State Request (Q.SAAL)

Synopsis

Message sent to Q.SAAL to retrieve current per link state in the same format as MTP2

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SS7_MSG_R_STATE (0x6215)
id	Link ID
src	User Module ID
dst	QSL_TASK_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	6

PARAMETER AREA		
Offset	**Size**	**Name**
0	1	lsc_state
1	1	cong_status
2	2	num_msgs
4	2	num_rtx_msgs

Description

This message is issued to the Q.SAAL module to read the current internal state of the link and the number of MSU's currently buffered. The results are written into the parameter area of the message and the message is returned to the sender.

Parameters

lsc_state

Current Link State control state

cong_status

Current congestion status

Value	Mnemonic	Description
1	IN_SERVICE	IN SERVICE state
2	OUT_SERVICE	OUT OF SERVICE state
3	INIT_ALIGN	INITIAL ALIGNMENT state

num_msgs

Total number of buffered MSU's

num_rtx_msgs

Number of MSU's in retransmit buffer. Unused - always zero.

4.6.6 SS7_MSG_R_STATS - Read Link Statistics Request (Q.SAAL)

Synopsis

Message sent to Q.SAAL module to retrieve per link statistics in same format as MTP2.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SS7_MSG_R_STATS (0x6214)
id	Link ID
src	User Module ID
dst	QSL_TASK_ID
rsp_req	0
hclass	0
status	0 = leave stats unchanged 1 = reset stats after reading
err_info	0
len	58

PARAMETER AREA		
Offset	**Size**	**Name**
0	4	insvc_duration - Duration of link in service state.
4	2	align_failures - Number of failed alignment attempts.
6	4	SU_err_count - unused, always 0.
10	4	NACK_count - unused, always 0.
14	4	busy_duration - unused, always 0.
18	4	txd_octets - Number of SIF and SIO octets transmitted.
22	4	rtx_octets - unused, always 0.
26	4	tx_msu_count - Number of MSU's transmitted.
30	4	rxd_octets - Number of SIF and SIO octets received.
34	4	rx_msu_count - Number of MSU's received.
38	4	cong_count - Number of congestion events.
42	4	cong_duration - Duration of link congestion.
46	4	discard_count - Number of MSU's discarded due to congestion.
50	4	discard_events - Number of congestion events leading to MSU discard.
54	4	period - Period during which the measurements have been collected (in multiples of 100ms).

Description

Message used to retrieve Q.SAAL per-link statistics. The statistics are written into the parameter area of the message and the message is returned to the sender. The internal statistics can be reset or left unchanged, depending on the setting of the status field. The message can be used during operation or when link has been stopped. Once the link has been 'ended' the statistics are not available.

4.6.7 MGT_MSG_QSL_EVENT - Q.SAAL Event Indication

Synopsis

Q.SAAL event indication generated by Q.SAAL module to advise management of Q.SAAL protocol events.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_QSL_EVENT (0x026c)
id	Link ID
src	QSL_TASK_ID
dst	Management module ID
rsp_req	0
hclass	0
status	As detailed in the table below
err_info	Timestamp
len	0

Description

Sent by Q.SAAL module to management when an event occurs.

Value	Mnemonic	Description
0x00	SCF_STOP	User requested disconnect
0x01	SCF_PROF	Incompatible profile parameter
0x02	SCF_SESA	Session is already active
0x03	SCF_DUP	Session ID already used
0x04	SCF_PORT	Underlying module failure
0x05	SCF_ALIGN	Ling alignment procedure failed
0x06	SCF_RSD	Remote site initiated disconnect
0x07	SCF_PROT	SSCF protocol error
0x10	S7G_CONG	Congestion onset

Value	Mnemonic	Description
0x11	S7G_CONG_CLR	Congestion abatement
0x12	S7G_CONG_DIS	Congestion discard
0x20	SCO_RESP	Response time out / link failure
0x21	SCO_BGN	BGN PDU unacked
0x22	SCO_ER	ER PDU unacked
0x23	SCO_BEJ	Initialize connection rejected
0x24	SCO_PROT	SSCOP Protocol error

4.6.8 MGT_MSG_SS7_STATE - Link State Indication (Q.SAAL)

Synopsis

Indication generated by Q.SAAL module to advise management of changes to the per-link state

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_SS7_STATE (0x0201)
id	Link ID
src	QSL_TASK_ID
dst	Management module ID
rsp_req	0
hclass	0
status	Link State (see below)
err_info	Timestamp
len	0

Description

This primitive is used by Q.SAAL to advise management of changes of state within the Link State Control function. These indications are only given if the STATE bit of the management event mask is set.

This message is intended for diagnostic and maintenance purposes and does not form part of the protocol specified primitives.

The LINK STATE is coded as shown in the following table:

Value	Mnemonic	Description
1	IN_SERVICE	Entered IN SERVICE state
2	OUT_SERVICE	Entered OUT OF SERVICE state
3	INIT_ALIGN	Entered INITIAL ALIGNMENT state

4.6.9 Primitives issued from MTP3-b

The following primitives are supported by the Q.SAAL module. For message definitions refer to *Dialogic® SS7 Protocols MTP2 Programmer's Manual*.

MTP2 Primitive	Description	NNI Primitive Equivalent
API_MSG_TX_REQ	Transmission Request	AAL-MESSAGE_FOR_TRANSMISSION
SS7_MSG_START	Start Link Request	AAL-START
SS7_MSG_STOP	Stop Link Request	AAL-STOP
SS7_MSG_EMGCY	Set Emergency Request	AAL-EMERGENCY
SS7_MSG_EMGCY_CLRD	Clear Emergency Request	AAL-EMERGENCY_CEASES
SS7_MSG_RTV_BSNT	BSNT Retrieval Request - extended version	AAL-RETRIEVE_BSNT
SS7_MSG_RTVL_REQ	Retrieval Request	AAL-RETRIEVAL_REQUEST_AND_FSNC
SS7_MSG_CONTINUE	Continue Request	AAL-CONTINUE (ignored)
SS7_MSG_FLUSH	Flush Request	AAL-FLUSH_BUFFERS
SS7_MSG_LOC_PR_OUT	LPO Request	N/A
SS7_MSG_LOC_PR_OK	LPO Recovered Request	N/A
SS7_MSG_L3_FAIL	Level 3 Failure Request	N/A

4.6.10 Primitives issued to MTP3-b

The following primitives are supported by the Q.SAAL module. For message definitions refer to *Dialogic® SS7 Protocols MTP2 Programmer's Manual*.

MTP2 Primitive	Description	NNI Primitive Equivalent
API_MSG_RX_IND	Received Data Indication	AAL-RECEIVED_MESSAGE
SS7_MSG_IN_SVC	In Service Indication	AAL-IN_SERVICE
SS7_MSG_OUT_SVC	Out of Service Indication	AAL-OUT_OF_SERVICE
SS7_MSG_RXD_BSNT	BSNT Indication - extended version	AAL-BSNT
API_MSG_RTVD_MSG	Retrieved Message Indication	AAL-RETRIEVED_MESSAGES
SS7_MSG_RTVL_COMPL	Retrieval Complete Indication	AAL-RETRIEVAL_COMPLETE
SS7_MSG_RTVL_NOT_POS	Retrieval Failure Indication	AAL-BSNT_ NOT_RETRIEVABLE
SS7_MSG_LINK_CONG	Link Congested Indication	AAL-LINK_CONGESTED
SS7_MSG_LINK_UNCONG	Link Congestion Cleared Indication	AAL-LINK_CONGESTION_CEASED
SS7_MSG_FLUSH_ACK	Flush Acknowledgement	N/A
SS7_MSG_REM_PR_OUT	RPO Indication	N/A
SS7_MSG_REM_PR_OK	RPO Cleared Indication	N/A

4.7 Event Indication Messages

Event indication messages are the mechanism by which protocol and software error events are reported to the application. These messages are generated asynchronously by different modules within the stack.

The messages in the event indication category include:

- MGT_MSG_EVENT_IND – Error Indication
- SSD_MSG_STATE_IND - Board Status Indication
- API_MSG_CNF_IND - Configuration Completion Status Indication
- MVD_MSG_LIU_STATUS - LIU Status Indication
- MGT_MSG_SS7_EVENT - MTP2 Q.791 Event Indication

4.7.1 MGT_MSG_EVENT_IND – Error Indication

Synopsis

Generic event indication message issues my a module to advise management of errors or events occurring within the module.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_EVENT_IND (0x0008)
id	See table below
src	Sending module id
dst	Management module id
rsp_req	0
hclass	0
status	ERROR CODE (see below)
err_info	Timestamp
len	0

Description

This message is sent to the management event module to advise of events or errors.

For error codes specific to the SS7MD board the ERROR_CODE and id field are coded as shown in the following table:

Value	Mnemonic	Id	Description
0xc0	HW_THERMAL	board_id	Exceeded thermal threshold
0xd7	SSD_OVRHEAT	board_id	Shutdown due to thermal issues

4.7.2 SSD_MSG_STATE_IND - Board Status Indication

Synopsis

Message sent to the application on completion of the reset and download sequence or on detection of a board status event.

Note: This message is not required when using the s7_mgt protocol configuration utility.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	SSD_MSG_STATE_IND (0x06a0)
id	board_id
src	SSD_module_ID (0x20)
dst	mgmt_id for SSD
rsp_req	Used to request a confirmation
hclass	0
status	event_type (see below)
err_info	0
len	4

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	board_type
2	2	failure_code

Description

This message is used to convey the status of a board reset operation (success of failure) to the user. The status is indicated in the status field of the message header. The following table shows the possible event_type values:

event_type

Value	Meaning
0x60	Reset successful
0x62	Board failure
0x66	License validation failure
0x67	License appears corrupt
0x70	Message congestion toward board cleared
0x71	Message congestion toward board onset

Parameter

The message parameters are:

board_type
Set to 16 for SS7MD.

failure_code

Value	Meaning
0x0000	undefined
0x00d7	Thermal failure

4.7.3 API_MSG_CNF_IND - Configuration Completion Status Indication

Synopsis

Message issued by the s7_mgt protocol configuration utility on completion of initial configuration sequence.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	API_MSG_CNF_IND (0x0f09)
id	0
src	0xcf
dst	Notification module (see below)
rsp_req	0
hclass	0
status	completion_status (see below)
err_info	Reserved for future use.
len	0

Description

This message is issued by the s7_mgt protocol configuration utility on completion of the initial configuration sequence and indicates either success (**status**=0) or an error condition that occurred during configuration. The message is only issued when s7_mgt is run with the `-i` command line option specifying the module ID of the *Notification Module* to which the message should be sent. For example:

```
s7_mgt -i0x2d
```

Note: It is recommended that the user invoke this option, then wait for an API_MSG_CNF_IND message to ensure that the application does not attempt to send messages until initial configuration is complete.

Parameters

The API_MSG_CNF_IND message header uses the following parameter:

completion_status

The result of initial configuration. The following table shows the possible values and their meanings.

Value	Meaning
0	Success
1	Error opening the config.txt protocol configuration file
2	Syntax or value error in the config.txt protocol configuration file
3	Error during configuration (invalid parameters)
4	Error during configuration (no response)

4.7.4 MVD_MSG_LIU_STATUS - LIU Status Indication

Synopsis

Message issued by the board to provide notification of changes in LIU status.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MVD_MSG_LIU_STATUS (0x0e01)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	MVD_module_ID
dst	MGMT_module_ID
rsp_req	0
hclass	0
status	liu_status (see below)
err_info	Reserved for future use.
len	0

Description

This message is issued by the board for every change of state on the trunk interface.

The MVD_MSG_LIU_STATUS message header uses the following parameters:

liu_id

The identity of the Line Interface Unit (LIU) to which the status indication applies.

liu_status

The LIU status. The following table shows the possible values and their meanings.

Value	Mnemonic	State
10	LIUS_SYNC_LOSS	Frame Sync Loss
11	LIUS_IN_SYNC	Frame Sync OK
12	LIUS_AIS	AIS Detected
13	LIUS_AIS_CLRD	AIS Cleared
14	LIUS_REM_ALARM	Remote Alarm
15	LIUS_REM_ALM_CLRD	Remote Alarm Cleared
20	LIUS_PCM_LOSS	PCM Loss
21	LIUS_PCM_OK	PCM Restored

4.7.5 MGT_MSG_SS7_EVENT - MTP2 Q.791 Event Indication

Synopsis

Message issued by the MTP2 module to advise management of protocol events in accordance with Q.791.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_SS7_EVENT (0x0202)
id	l2_llid
src	MTP2_module_ID
dst	Management module ID
rsp_req	0
hclass	0
status	EVENT CODE (see below)
err_info	Timestamp
next	0
len	0

Description

This primitive is used by MTP2 to advise system management of the occurrence of protocol related events in accordance with Q.791. Currently, these events relate to the following:

- the reason for a signaling link (previously in service) going out of service (events prefixed S7F_)
- a timer expired (prefixed S7T_)

- a proving failure (prefixed S7P_)

The MGT_MSG_SS7_EVENT message header includes the following field:

Event Code

The type of event. The following table indicates the possible values and their meanings.

Value	Mnemonic	Description
0	S7F_STOP	Stop request received
1	S7F_FIBR_BSNR	Abnormal FIBR/BSNR
2	S7F_EDA	Excessive delay of acknowledgement
3	S7F_SUERM	Excessive error rate (SUERM or EIM)
4	S7F_ECONG	Excessive congestion
5	S7F_SIO_RXD	Unexpected SIO received
6	S7F_SIN_RXD	Unexpected SIN received
7	S7F_SIE_RXD	Unexpected SIE received
8	S7F_SIOS_RXD	SIOS received
32	S7T_T1_EXP	Timer T1 expiry
33	S7T_T2_EXP	Timer T2 expiry
34	S7T_T3_EXP	Timer T3 expiry
48	S7P_AERM	Failed proving attempt

4.8 Status Request Messages

Status request messages can be used to poll the status of modules or systems running on the board.

The messages in the status request category include:

- LIU_MSG_R_STATE - LIU Read State Request
- LIU_MSG_R_STATS - LIU Read Statistics Request
- MGT_MSG_R_BRDINFO - Read Board Info Request
- DVR_MSG_R_L1_STATS – Layer 1 Link Statistics Request

4.8.1 LIU_MSG_R_STATE - LIU Read State Request

Synopsis

Message sent by the application to read the current state of a Line Interface Unit (LIU).

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	LIU_MSG_R_STATE (0x5e39)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0
err_info	0
len	1

PARAMETER AREA		
Offset	**Size**	**Name**
1	1	state

Description

This message is sent to the board to read the current operating state of a LIU. The user should always request a confirmation message. The confirmation message indicates success with a **status** value of 0 and contains the current LIU state information in the parameter area of the message.

Parameters

The LIU_MSG_R_STATE message includes the following parameter:

state

The current state of the LIU. The following table shows the returned permitted values and their meanings.

Value	Description
0	OK
1	PCM Loss
2	AIS
3	Sync Loss
4	Remote Alarm

4.8.2 LIU_MSG_R_STATS - LIU Read Statistics Request

Synopsis

Message used to read back performance statistics associated with a Line Interface Unit (LIU).

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	LIU_MSG_R_STATS (0x5e36)
id	liu_id (in the range 0 to one less than the number of LIUs)
src	Sending module ID
dst	MVD_module_ID
rsp_req	Used to request a confirmation.
hclass	0
status	0 to read statistics 1 to read statistics and reset counters
err_info	0
len	42

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	Reserved. Must be set to 0.
2	2	Reserved. Must be set to 0.
4	4	duration
8	4	bit_errors
12	4	code_violations
16	4	frame_slips
20	4	oos_transitions
24	4	errored_seconds
28	4	severely_errored_seconds
32	2	prbs_status
34	8	Reserved. Must be set to 0.

Description

This message is used to collect performance statistics for a given Line Interface Unit (LIU). A module requesting LIU statistics information is required to complete the version parameter of the message, request a response, and set all additional parameter values to zero.

The confirmation message contains a non-zero status in the event of an error. The statistics can either be read and left unchanged, or read and reset in a single operation depending on the setting of the status field in the request message.

Parameters

The LIU_MSG_R_STATE message includes the following parameters:

duration

The duration (in seconds) since the statistics were last reset.

bit_errors

A count of the actual number of bit errors detected by the framer device for the LIU. The precise meaning of this parameter varies depending on the operating mode of the framer:

— For E1 operating modes, it is the number of errors detected in the frame alignment word.

— For T1 interfaces operating in D3/D4 frame format, it is the number of framing bit errors.

— For T1 interfaces operating in ESF format, it is the number of CRC6 errors.

Note: In general, the user should use the errored_seconds and severely_errored_seconds parameters instead since these parameters provide normalized values that have the same meaning for all modes of operation.

code_violations

A count of all the line code violations detected on the interface.

frame_slips

A count of the number of frame slips that have occurred on the interface.

oos_transitions

A count of the number of transitions from the in synchronization state to the out of synchronization state.

errored_seconds

The number of seconds since the statistics were last reset during which the interface contained errors. An *errored second* is any second during which the interface is out of synchronization, or there are frame slips or bit errors.

If the liu frame format is configured as either D4 or E1, with CRC generation disabled, then line code violations are also included in the errored second count..

severely_errored_seconds

The number of severely errored seconds since the statistics were last reset. A *severely errored second* is a second during which the interface is out of synchronization or the bit error rate exceeds 1 in 1,000.

prbs_status

The status of Pseudo Random Bit Sequence (PRBS) indications.

- 1 = PRBS is valid, the counts are correct.

- 3 = PRBS sequence is not synchronized.

4.8.3 MGT_MSG_R_BRDINFO - Read Board Info Request

Synopsis

Message used to request basic board information.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	MGT_MSG_R_BRDINFO (0x6f0d)
id	0
src	Sending module ID
dst	MGMT_module_ID (0xef)
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	60

PARAMETER AREA		
Offset	**Size**	**Name**
0	1	board_type
1	1	board_rev
2	28	Reserved
30	20	bsn
50	4	Reserved
54	1	cur_temp
55	1	max_temp
56	4	Reserved

Description

This message is provided to request a reply indicating the values of a number of attributes associated with the board. On receipt of this request, the module returns the message with the **status** "SUCCESS - 0" to the sender and includes the information requested.

Parameters

The MGT_MSG_R_BRDINFO message includes the following parameters:

board_type

The board type. Board type. 16 for DSI SS7MD Board.

board_rev

The board revision number. Currently 0.

bsn

The board's production serial number (ASCII characters, null terminated)

cur_temp

Signed 8-bit value containing the current temperature of the board within the range -128 to 127 degrees Celsius.

max_temp

Signed 8-bit value containing the maximum temperature the board has reached since SSDM was last started. Value is within the range -128 to 127 degrees Celsius.

4.8.4 DVR_MSG_R_L1_STATS – Layer 1 Link Statistics Request

Synopsis

Message issued to driver layer to read per-link layer 1 statistics.

Format

MESSAGE HEADER	
Field Name	**Meaning**
type	DVR_MSG_R_L1_STATS (0x6136)
id	l1_llid
src	Sending module ID
dst	module ID of onboard HDLC/SS7 driver (0x80)
rsp_req	Used to request a confirmation, sending layer's bit must be set.
hclass	0
status	0 – Read statistics 1 – Read statistics and reset
err_info	0
len	48

PARAMETER AREA		
Offset	**Size**	**Name**
0	4	duration
4	4	abort_cnt
8	4	CRC_errs
12	4	Reserved.
16	4	length_errs
20	4	rx_overrun
24	4	receiver_busy_cnt
28	4	rx_frame_cnt
32	4	Reserved.
36	4	tx_frame_cnt
40	4	Reserved.
44	4	rx_busy_status

Description

This message provides the user with a number of statistics on a per link basis. If the user sends the message status set to 1 the statistics are reset after being read.

Parameters

The DVR_MSG_R_L1_STATS message includes the following parameters:

duration
Duration in tenths of a second since the statistic counters were last reset.

abort_cnt
The number of aborts received on the link.

CRC_errs
Number of CRC errors received on the link.

length_errs
The number of received frames that were designated as either too long or too short for a configured protocol.

rx_overrun
The number of times that the receiver was forced to discard incoming frames as a result of there being no internal buffers available to receive the incoming data. This is a count of the number of events rather than a count of the number of frames discarded.

receiver_busy_cnt
The number of times the receiver has entered the busy state as a result of the number of internal buffers falling below a set threshold.

rx_frame_cnt
The number of (error-free) frames received on the link, excluding any duplicate frames that are discarded as a result of the internal filtering mechanism.

tx_frame_cnt
The number of frames transmitted on the link excluding any repeated frames that are generated automatically (for example, repeated FISUs or LSSUs).

rx_busy_status
Normally set to 0, but in the event of the receiver being in the a "busy" state (where the number of internal buffers falls below a fixed internal threshold), this field is set to 1.

Appendix A - Protocol Configuration Using Discrete Messages

This appendix provides guidelines for protocol configuration using individual messages.

A.1 Protocol Configuration Using Individual Messages

As an alternative to using the s7_mgt protocol configuration utility it is possible to perform protocol configuration by building and sending messages directly to the board. This approach means that it is necessary to write some application code to handle configuration, but has the advantage that the application can, if required, reconfigure the board without restarting the application.

Communication with the board is achieved by sending and receiving messages. The configuration sequence is described below. The application should allocate a message structure using the getm( ) library function and send it to the board using the GCT_send( ) library function. The application should periodically call the GCT_receive( ) or GCT_grab( ) library functions to receive messages from the board. The GCT_receive( ) function blocks until a message is available, while the GCT_grab( ) function returns immediately. Once the application has finished processing the received message, it should release the message structure back to the system by calling the relm( ) library function. The library functions are described in the Software Environment Programmer's Manual.

To configure the board using individual messages, the following sequence should be used. The message sequence is shown diagrammatically in Figure 3. Protocol Configuration Message Sequence Diagram.

1. Build and send an SSD Reset Request (SSD_MSG_RESET) to the SSD module. This message contains the parameters required to initialize the SSD module.
2. Then build and send a Board Reset Request (SSD_MSG_RST_BOARD) for each board in the system. This message contains the address (or identifier) of the board and the name of the code file. It causes the board to be reset and the code file downloaded. For each board, the application should wait until a Board Status Indication (SSD_MSG_STATE_IND) is received and inspect the status field to determine if the reset operation was successful. On failure, the user should check carefully the ssdm parameters and try again.
3. Build and send a Board Configuration Request (MGT_MSG_CONFIG0) to the onboard management task (MGMT_TASK_ID) to configure the basic board parameters. When using Dialogic® DSI SS7MD Boards, the value of the config_type parameter in the Board Configuration Request must be set to 3. For this version of the message, the automatic configuration of MTP parameters is not supported. Wait for the confirmation message and check the status.
4. To set up the LIU and port for the T1/E1 ports, the LIU Configuration Request should be used. Wait for the confirmation message for each LIU and check the status.

   For each link in the system:

5. Build and send a Layer 1 Configuration Request (MGT_MSG_L1_CONFIG) to set up the physical configuration parameters for the link. This message should be sent to the onboard management module. Wait for the confirmation message and check the status.

6. Build and send an MTP2 Link Configuration Request (SS7_MSG_CONFIG) to set up the MTP2 configuration parameters. See the MTP2 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
7. Build and send an MTP3 Module Reset Message (MTP_MSG_RESET) to reset the MTP3 module. See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
8. Build and send an MTP3 Module Configuration Request (MTP_MSG_CONFIG) to set up configuration parameters that relate to the MTP3 environment (number of link sets and links to support, module_ids for user part modules etc.). See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.

For each link set perform the following:

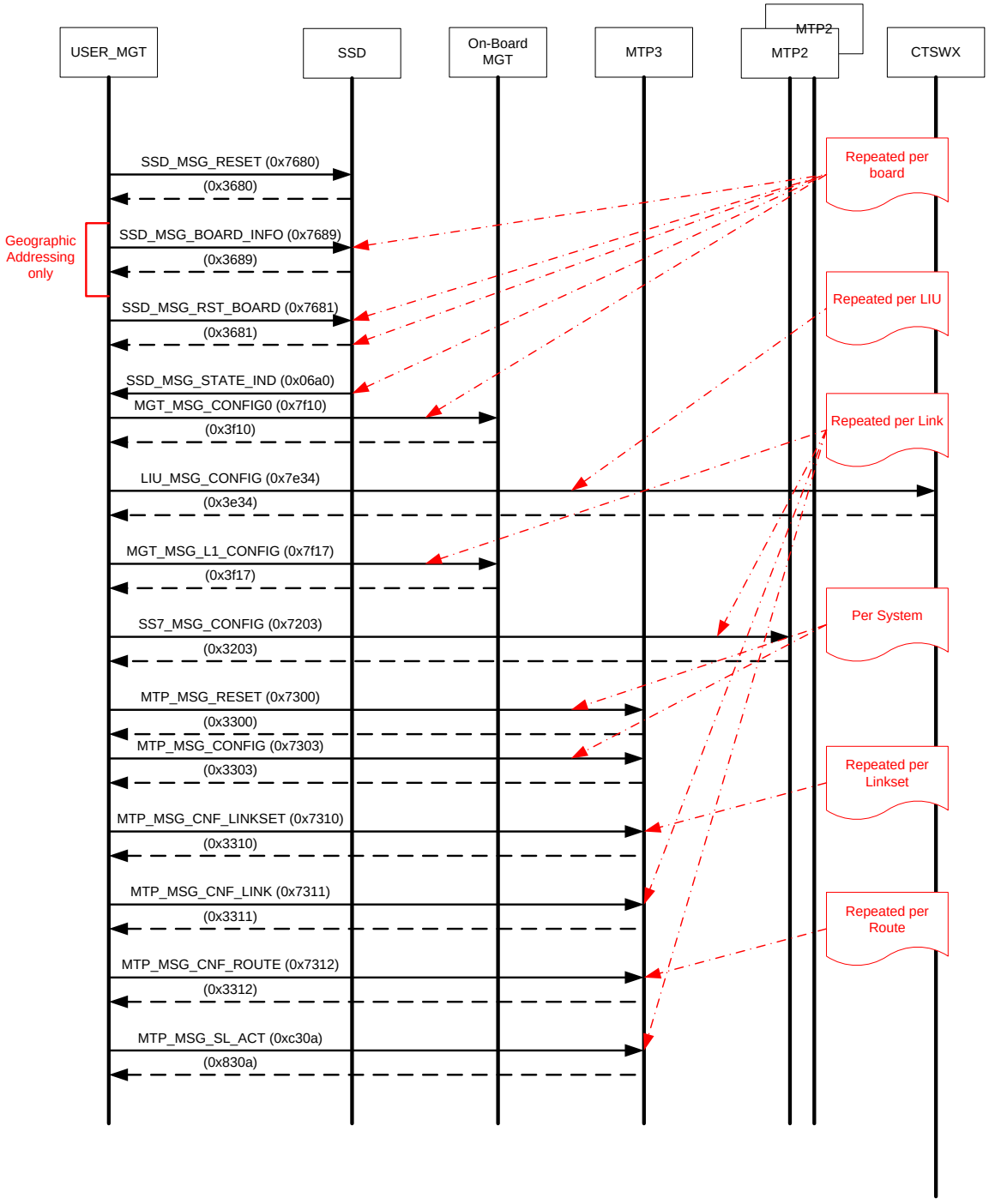
9. Build and send an MTP3 Link Set Configuration Request (MTP_MSG_CNF_LINKSET) to set up configuration parameters for the individual link set (for example, local and adjacent point codes and the number of links in the link set). See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.

For each link in the link set perform the following:

10. Build and send an MTP3 Signaling Link Configuration Request (MTP_MSG_CNF_LINK) to set up configuration parameters for the individual link. See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
11. For each destination that needs to be accessed (including all adjacent signaling points), build and send an MTP Route Configuration Request (MTP_MSG_CNF_ROUTE) to set up configuration parameters for the route. See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
12. Proceed now with the User Part configuration procedure. Once this is complete, issue an MTP Link Activation Request (MTP_MSG_ACT_SL) for each link in the system as required to bring the link into service.

Further links, link sets and routes may be dynamically added at runtime using the same message sequences.

Figure 3. Protocol Configuration Message Sequence Diagram



A.2 Monitoring Configuration Using Individual Messages

To configure the board for monitoring it using individual messages, proceed as follows:

1. Build and send an SSD Reset Request to the SSD module. This contains the parameters to initialize the SSD module.
2. Build and send a Board Reset Request for each board in the system. This message contains the address (or identifier) of the board and the name of the code file. It causes the board to be reset and the code file downloaded. For each board, the application should wait until a Board Status Indication is received and inspect the status field to determine if the reset operation was successful. On failure, the user should check carefully the parameters and try again.
3. Build and send a Board Configuration Request (MGT_MSG_CONFIG0) to the onboard management task (MGMT_TASK_ID) to configure the basic board parameters. When using DSI SS7MD Boards, the value of the config_type parameter in the Board Configuration Request must be set to 3. For this version of the message, the automatic configuration of MTP parameters is not supported. Wait for the confirmation message and check the status.
4. To set up the LIU and port for the T1/E1 ports, the LIU Configuration Request should be used. For monitoring, the sensitivity parameter should be set to either 2 for high impedance operation, or 4, for operation with a Protected Monitoring Point. Wait for the confirmation message for each LIU and check the status.

For each link in the system:

5. Build and send a Layer 1 Configuration Request (MGT_MSG_L1_CONFIG) to set up the physical configuration parameters for the link. This message should be sent to the onboard management module. Wait for the confirmation message and check the status.
6. Build and send an MTP2 Link Configuration Request (SS7_MSG_CONFIG) to set up the MTP2 configuration parameters for monitoring operation. See the MTP2 Programmer’s Manual for the message definition. Wait for the confirmation message and check the status.

A.3 Q.SAAL Protocol Configuration Using Individual Messages

The process to configure the board for Q.SAAL links using individual messages is closely related to section A.1 on page 104. The full message sequence is shown diagrammatically in Figure 4. Q.SAAL Configuration Message Sequence Diagram.

1. Build and send an SSD Reset Request (SSD_MSG_RESET) to the SSD module. This message contains the parameters required to initialize the SSD module.

For each board in the system:

2. Build and send a Board Reset Request (SSD_MSG_RST_BOARD). This message contains the address (or identifier) of the board and the name of the code file. It causes the board to be reset and the code file downloaded. For each board, the application should wait until a Board Status Indication (SSD_MSG_STATE_IND) is received and inspect the status field to determine if the reset operation was successful. On failure, the user should check carefully the event and failure codes as defined in the SSD_MSG_STATE_INDSSD_MSG_STATE_IND message and try again.
3. Build and send a Board Configuration Request (MGT_MSG_CONFIG0) to the onboard management task (MGMT_TASK_ID) to configure the basic board parameters. When using Dialogic® DSI SS7MD Boards, the value of the config_type parameter in the Board Configuration Request must be set to 3. Wait for the confirmation message and check the status.
4. To set up the LIU and port for the T1/E1/J1 ports, the LIU Configuration Request (LIU_MSG_CONFIG) should be used. Wait for the confirmation message for each LIU and check the status.

For each board running ATM links:

5. Configure the ATM module using a ATM_MSG_CONFIG message to configure the ATM per board options and vpi/vci masks. Wait for the confirmation message from each ATM module and check the status.

For each ATM cell stream in the system:

6. Build and send an ATM cell stream configuration request (ATM_MSG_CFG_STREAM) to set up the parameters of the ATM link. Wait for the confirmation message and check the status.

For each Q.SAAL link in the system:

7. Build and send a Q.SAAL Link Configuration Request (QSL_MSG_CFG_LINK) to set up the per link configuration parameters. Wait for the confirmation message and check the status.
8. If the required per link timer values are different from the defaults, build and send a per Q.SAAL link timer configuration (QSL_MSG_CFG_TIMERS). Wait for the confirmation message and check the status.

Once per system:

9. Build and send an MTP3 Module Reset Message (MTP_MSG_RESET) to reset the MTP3 module. See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
10. Build and send an MTP3 Module Configuration Request (MTP_MSG_CONFIG) to set up configuration parameters that relate to the MTP3 environment (number of link

sets and links to support, module_ids for user part modules etc.). See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.

For each link in the link set, perform the following:

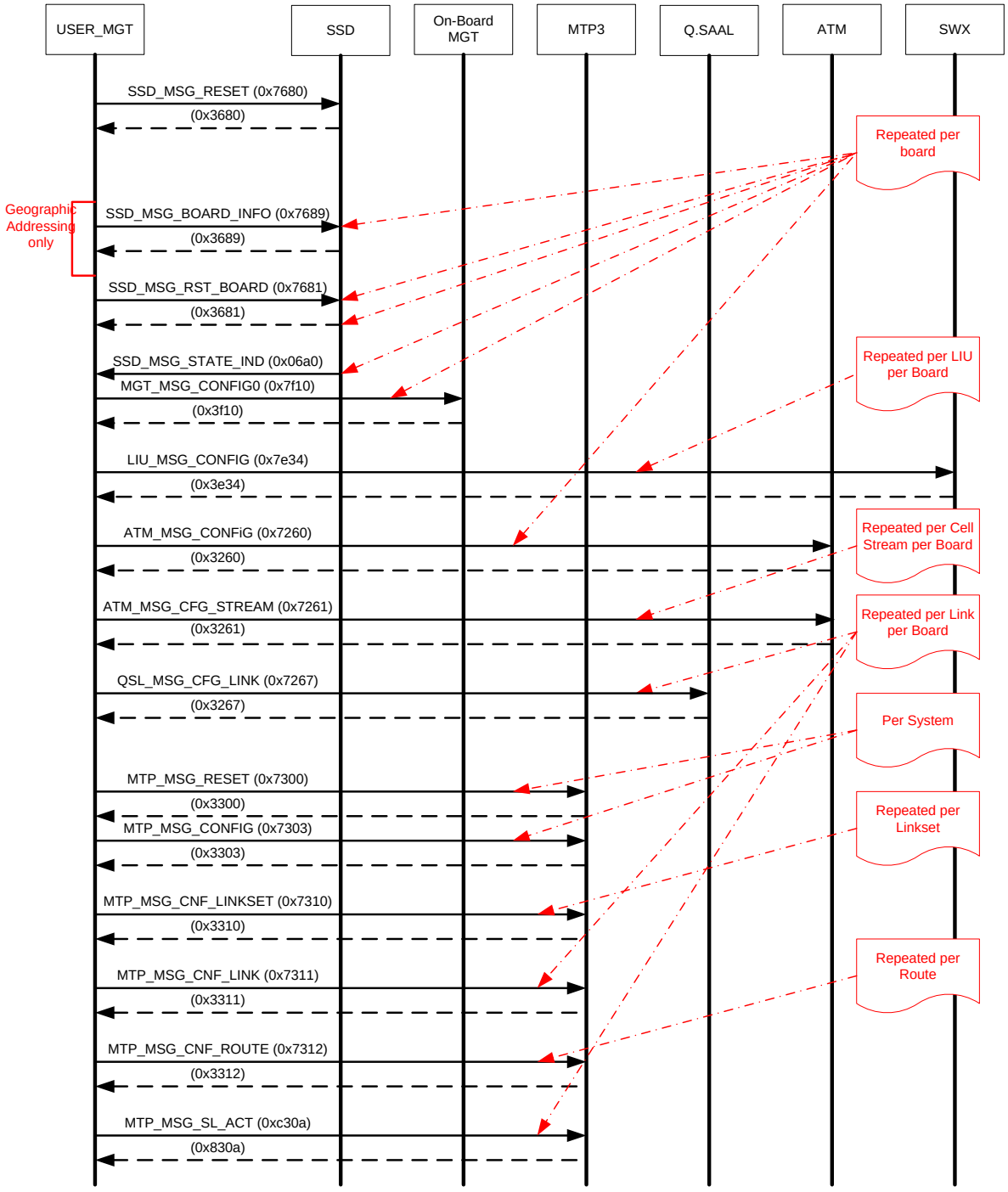
11. Build and send an MTP3 Link Set Configuration Request (MTP_MSG_CNF_LINKSET) to set up configuration parameters for the individual link set (for example, local and adjacent point codes and the number of links in the link set). See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
12. Build and send an MTP3 Signaling Link Configuration Request (MTP_MSG_CNF_LINK) to set up configuration parameters for the individual link. See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.

For each link set in the system, perform the following:

13. For each destination that needs to be accessed (including all adjacent signaling points), build and send an MTP Route Configuration Request (MTP_MSG_CNF_ROUTE) to set up configuration parameters for the route. See the MTP3 Programmer's Manual for the message definition. Wait for the confirmation message and check the status.
14. Proceed now with the User Part configuration procedure. Once this is complete, issue an MTP Link Activation Request (MTP_MSG_ACT_SL) for each link in the system as required to bring the link into service.

    Further links, link sets and routes may be dynamically added at runtime using the same message sequences.

Figure 4. Q.SAAL Configuration Message Sequence Diagram



Appendix B - Thermal guidelines for server selection

The Dialogic® DSI SS7MDL4 Network Interface Board is a high performance SS7 board capable of delivering over 30,000 MTP2 packets per second. To achieve such levels of performance, state of the art processors operating at high clock frequencies are used. At the same time, to address the requirements of current server designs, the DSI SS7MDL4 board is presented in a low profile, PCI Express form factor, with less than one third (1/3) of the surface area of a full PCI or PCI Express board.

When high power components are combined in a board with a small area, heat dissipation becomes an important design consideration. It is essential that the chassis provides sufficient cooling to remove the heat dissipated by the board.

Cooling is achieved in two ways:

1) operating the server in an environment where the ambient temperature is lower than the temperature of the components being cooled,

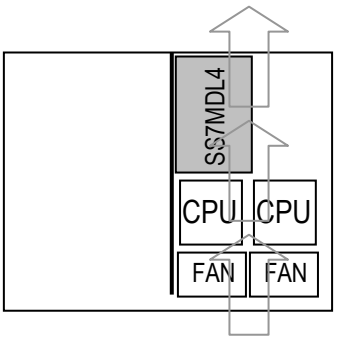
2) airflow that moves cooler ambient air into the server, and moves hot air away from the heat generating components. When designing a solution that utilizes a DSI SS7MDL4 board, proper airflow is a critical factor.

B.1 Chassis Selection

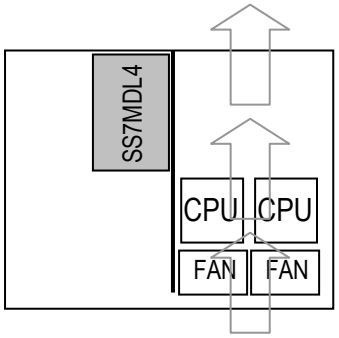
The SS7MDL4 board is designed for use in servers that provide an airflow rate of 300 linear feet per minute (1.5 m/s) across the board. However, it is possible that the airflow reaching the expansion slots may not be known or otherwise specified. To help determine if your chassis provides sufficient airflow to accommodate an SS7MDL4 board, please confirm that:

- Exterior inspection reveals visible air vents in-front and at the back of the chassis
- There are at least two cooling fans inside the chassis
- Clear airflow paths exist across the proposed location for the SS7MDL4 board
- Fans are positioned to cool the area occupied by the SS7MDL4 board

If the proposed location for the SS7MDL4 board lies within the airflow for cooling the main CPUs, then the cooling is likely to be adequate. However, if the board will be placed outside of the main CPU cooling airflow, it may be necessary to investigate (via further testing) the thermal performance in more detail to determine whether temperature issues could arise. See the example diagrams below:



Likely to be Adequate
SS7MDL4 board is in line with the airflow created by the main fans as they cool the CPUs. In this scenario, the cooling is likely to be adequate to prevent the occurrence of temperature issues.



Further tests required
SS7MDL4 board is not in line with the airflow created by the main fans. In this scenario, the cooling (which may be generated by secondary fans) is likely to be less powerful and may be insufficient to adequately cool the board to an extent to reliably avoid temperature issues.

Users seeking to confirm proper operational cooling should measure the temperature of the boards in their system using the on board thermal sensor. The Dialogic® DSI Development Package includes the tempmon utility, which enables the user to periodically read back the temperature of all the SS7MD boards in the system.

Glossary of Terms

AAL5 ATM Adaptive Layer part 5

AIS Alarm Indication Signal (Blue alarm).

ATM Asynchronous Transfer Mode

config.txt A text file used for protocol configuration.

ctu An example program that demonstrates how a user application can interface with telephony user parts, such as ISUP.

DPC Destination Point Code. Identifies the address (point code) of the SS7 network node to which a Message Signal Unit (MSU) should be directed.

DSI Distributed Signaling Interface

gctload A program that handles the initialization sequence and creates inter-process communication.

HSL High Speed Link conforming to the Q.703 Annex A specification.

IMA Inverse Multiplexed ATM

ISUP ISDN User Part. A SS7 stack layer that defines the messages and protocol used in the establishment and tear down of voice and data calls over the public switched network, and to manage the trunk network on which they rely.

Link A physical and logical connection between two signaling points.

Link Set One or more signaling links connected between the same pair of signaling points.

LIU Line Interface Unit.

LSL Low Speed Link conforming to the specification in Q.703.

MSU Message Signal Unit. A data unit that carries signaling information for call control, transaction processing, network management and maintenance. Typically, the MSU is carried in the Signaling Information Field (SIF) of SS7 messages.

MTP Message Transfer Part. Layers 1 to 3 of the SS7 protocol stack broadly equivalent to the Physical, Data Link and Network layers in the OSI protocol stack. See also MTP1, MTP2, and MTP3.

MTP1 Message Transfer Part Level 1. An SS7 stack layer that defines the physical and electrical characteristics of the signaling links of the SS7 network. Signaling links use DS0 channels and carry raw signaling data at a rate of 48, 56 or 64 kbps.

MTP2 Message Transfer Part Level 2. An SS7 stack layer that provides link-layer functionality. Ensures that two end points of a signaling link can reliably exchange signaling messages. It provides error checking, flow control and sequence checking.

MTP3 Message Transfer Part Level 3. An SS7 stack layer that provides network-layer functionality. Ensures that messages can be delivered between signaling points across the SS7 network regardless of whether the signaling points are directly connected. It provides node addressing, routing, alternate routing and congestion control.

mtpsl An example utility that can also be used to activate and deactivate signaling links.

PRBS Pseudo Random Bit Sequence. A technique used for bit error rate testing on T1/E1/J1 trunks.

Q.SAAL Link conforming to Q.2140/Q.2110/GR-2878.

RAI Remote Alarm Indication (Yellow alarm).

route An MTP3 concept that determines how signaling is distributed over linksets. A route consists of a destination point code and the linkset ID of one or two linksets over which traffic to the destination node should be routed. When two linksets are provided, the user can choose to load share traffic or treat the linksets as primary and secondary.

s7_log A utility that enables messages received from the protocol stack to be logged in a text file. Typically used for diagnostic purposes.

s7_mgt A utility that performs one time protocol configuration of all protocol modules using configuration parameters from the config.txt file.

s7_play A utility used to read messages from a text file and send them to the system. Typically used for diagnostic purposes.

SLS Signaling Link Selection field. A field in the MTP3 routing label used to determine the selection of an outgoing link for messages being routed to another point code.

SS7 Signaling System Number 7

SS7 Protocol Stack A set of software modules that implement the various layers of the SS7 protocol stack.

SS7MD An identifier for the family of Dialogic® Multi Dimension Network Interface Boards.

ssdm A process that runs on the host interfacing with the device driver to download software to the board and enable message passing to and from the board.

STP Signaling Transfer Point.

system.txt A text file used for system configuration.

upe A worked user part example which exchanges messages with the MTP3 module.

vci Virtual Channel Indicator

vpi Virtual Path Indicator